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ABSTRACT

Volume IV, Part A of a six-volume final report (which covers the findings of a research project on policy and technology related to rehabilitation of disabled individuals) presents an overview of the methodology used in the project, much of the data used in projecting consequences and policymaking impacts in project analysis, and insight into techniques used to determine exogenous factors such as the attitudes of persons influenced by rehabilitation technology. Project paper 1 describes the logic underlying the various steps and stages of project development. Reviewed in paper 2 is the overall social context within which elements of a rehabilitation-technology interact (included are scenarios describing trends in social and economic development through the year 2025). Project paper 3 presents the life-function oriented analysis of the 14 representative desabilities researched in the project. Limitations in data gathering and analysis are pointed out. A fourth paper contains the original project report on rehabilitation technologies related to each of the 14 disability areas. (SBH)

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HUMAN REHABILITATION TECHNIQUES

A TECHNOLOGY ASSESSMENT

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Volume IV
Part A

Supplemental Report:
Project Papers

EC104171

FOREWORD

This document is the fourth volume of the final report *Technology Assessment: Human Rehabilitation Techniques*, a project conducted at Texas Tech University by the Department of Industrial Engineering, the Research and Training Center in Mental Retardation, the Department of Systems, and the Technical and Professional Writing Program. The research has been conducted with the support of National Science Foundation grants ERP 75-10594 and ERP 75-10594 A01, monitored by the Directorate for Research Applications, Division of Exploratory Research and Systems Analysis.

Richard A. Dudek, Horn Professor and Chairman of the Department of Industrial Engineering has been a co-principal investigator and director of the project. Gerard J. Bensberg, Director of the Research and Training Center in Mental Retardation, and M. M. Ayoub, Professor of Industrial Engineering, have been co-principal investigators. Carol M. Sigelman and Andrew S. Martin of the Research and Training Center in Mental Retardation and Robert F. Powers of the Department of Industrial Engineering have been program managers for the project. James R. Burns and William M. Marcy of the Department of Systems have been in charge of the modeling used in the project. Technical writing has been performed by Charles W. Brewer and Cynthia E. Lyle of the Technical and Professional Writing Program. In addition, several research assistants and support personnel, as listed in the individual volumes of the study, have contributed to the project.

The project team wishes to acknowledge the efforts of individuals who have served on the Oversight Committee, Elizabeth Boggs, Kan Chen, Beatrix Cobb, Ronald Conley, Richard Herman, John Noble, Jr., Evan Vlachos, and Lester Wolcott; of Lee Phillips who served effectively as a program manager for a short time before leaving Texas Tech; of Brian Lambert who served as Work Session Conference Coordinator; of those who participated in the work-sessions chaired by Ted Hartman, David Malone, Blair Rowley, Evan Vlachos and John Wittman; and of Anne Seitz, the Secretary of the Project.

Although the National Science Foundation has supported this project, the findings, conclusions and recommendations expressed are those of the research team and do not necessarily reflect the views of NSF.

PREFACE

During the course of Technology Assessment: Human Rehabilitation Techniques, a vast amount of information was collected for analysis by project team members. This volume, supplementary to the final report, presents much of this information in the form in which it was used by persons involved in the project. Project papers provide (1) an overview of the methodology used in the project, (2) much of the data used in projecting consequences and policymaking impacts in project analysis, and (3) an insight into techniques used to determine exogenous factors such as the attitudes of persons influenced by rehabilitation technology.

Project paper 1 is an overview of the methodology and procedures planned for use in the project. This paper is of historical interest in its describing the logic underlying the various steps and stages of project development.

Project paper 2 describes the overall social context within which elements of a rehabilitation-technology interact. Scenarios describing trends in social and economic development through the year 2025 are described.

Project paper 3 is the original life-function oriented analysis of the 14 representative disabilities upon which assessment is based. This paper elaborates upon many of the limitations in data gathering and analysis which must be thoroughly understood to permit any rigorous understanding of project results, conclusions and recommendations. Much of the substantive information from paper 3 appears in chapter 3 of volume 1, the final report of the project.

Project paper 4 is the original report on rehabilitation technologies. Most of the substantive information in this paper is presented in chapter 4 of volume 1.

Project paper 5 contains abstracts of contract papers in exogenous factors and rehabilitation technology. Included are abstracts of only those contract papers available at the time of the work session inference. Chapter 5 of volume 1 contains much of the substantive information from this project paper. The entire, unabridged contract papers are reproduced in volume 3 supplemental to the final report.

Project paper 6 presents rehabilitation-oriented data describing economic, population, and other variables oeprating both internal to and external to rehabilitation. Salient excerpts from this paper appear in chapter 5 of volume 1.

Project paper 7 describes some of the attitudinal elements which enter into the operation of rehabilitation within society. This paper presented some views of rehabilitation endorsed by some members of society as well as the responses which expression of these views elicited from work-session conference participants. Underlying paper 7 was a broader effort by project team members to determine social attitudes axioms, and assumptions which would likely affect rehabilitation through 2025.

Project paper 8 describes the basic operation of the computer-supported handling effort carried out during and subsequent to the work-session conference. This paper reflects the design of the modeling effort developed prior to the conference; final design of and operation of the modeling effort and reported in the volume 6 supplement to the final report.

None of the project papers included in this volume reports final results, conclusions, or recommendations arrived at by the project. Each paper, however, is of historical importance insofar as is represents an intermediate stage of development of project results, conclusions, and recommendations.

VOLUME 4A

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CONCEPTUAL FRAMEWORK/PROGRAM THRUSTS

Introduction

Technology Assessment is a class of policy study which systematically identifies and explores the full range of social economic, environmental, institutional and other consequences of the introduction of a new technology into our society; or of the extension or modification of an existing technology, more extensively, intensively or in new ways; with special emphasis on those consequences that are unintended, indirect or delayed.

According to Joseph F. Coates (1974) of the Office of Technology Assessment there are six basic assumptions which underlie technology assessment. These are: (1) technology assessment is a policy tool, (2) technology assessment is likely to be iterative and part of an interlocking set of studies, (3) new technological knowledge creates new ignorance, (4) a major policy need is the organization of certainty and uncertainty to define effective strategies and tactics for managing any particular technology, (5) more information and analysis rather than less promotes better decisions, and (6) in the long run, indirect and unanticipated effects of a technology are often more significant than the immediate or planned consequence. In addition to making these basic points, Coates suggests that the meaning of technology must be viewed in its broadest sense. It is apparent then, that technology assessment has as its objective to anticipate and influence the societal effects of technology with greater comprehension and confidence.

The origin of the concept of technology assessment cannot be traced to any one person or group. It is quite probably a result of a broad change in the national conscienceness which is manifested in the environmental impact policy act of 1969 which specifies that environmental impact statements must be prepared for every action which may "sufficiently effect the quality of the human environment." It is also a result of the change that brought "technology forecasting" to industry and the military. Public discussion of the concept of technology assessment began as early as 1965 with hearings by the House subcommittee on Science Research and Development of the Committee on Sciences and Astronautics. In 1966 the establishment of an Office of Technology Assessment was first proposed in the House of Representatives and in 1972 Congress passed a law establishing the Office. Since then, the Office Technology Assessment (OTA) has joined the much larger General Accounting Office and the Library of Congress as a Congressional Service Agency. The purpose of OTA is to collect Technology Assessment information for forwarding to both Congress and the public. Parallel with the interest of Congress, the National Science Foundation through its division of Research Applied to National Needs started a program of funding for TA research. First, projects dealing with TA methodology and candidates technologies for assessment were funded. Subsequently specific technology assessment projects were funded. The project discussed here is funded by the NSF through its Office of Exploratory Research and Problem Assessment.

Since it is generally accepted that technological change is necessary for the growth and benefit of society it also behooves society to utilize technology as a means to aid the development and control of technology and to provide better data to the policy maker. Figure 1-1 gives a conceptual idea of where technology assessment fits into this scheme of development and control of technology through policy formulation.

According to Dr. Vary T. Coates (1975) of George Washington University, "Technology Assessment is an attempt to reintergrate fields of analysis on a larger scale in order to address the impacts of technological development--the consequences of technology as it affects systems, institutions and processes which are community wide or even regional, national, societal or global in scope." The consequences are of importance to economics, environment, and societal values and functioning. Technology Assessment is holistic and decision oriented. It is not a discipline or even a combination of disciplines, but it is an approach to analysis for policy formulation. It is more an art form than a science. TA has no specific methodology of its own, but it borrows from every possible source such as economics, operations research and the social sciences in its approach to any problem.

Three types of technology assessment are generally recognized. These are project, technology and problem oriented assessments.

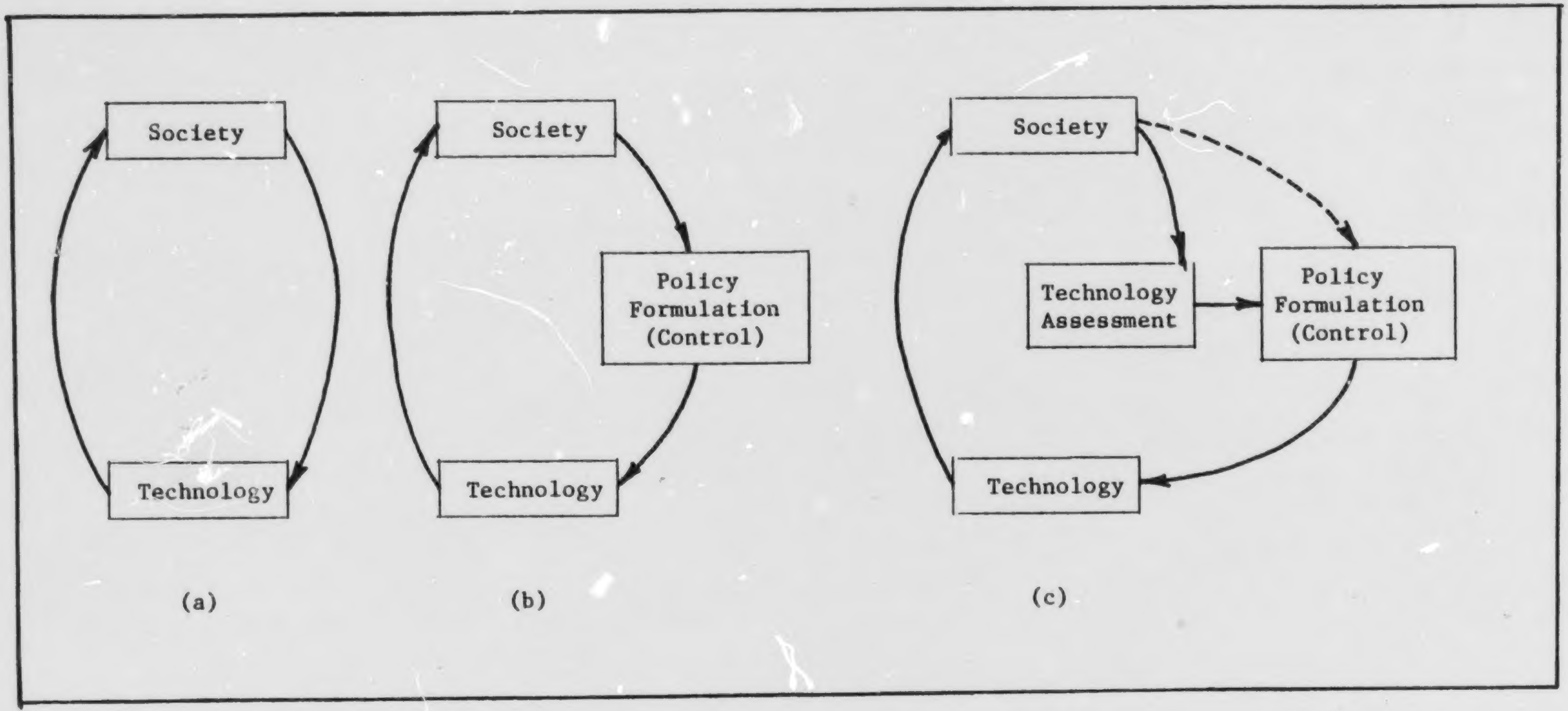

Society
Technology
(a)
Society
Policy Formulation (Control)
Technology
(b)
Society
Technology Assessment
Policy Formulation (Control)
Technology
(c)

Figure 1-1. Technology assessment's place in society - technology interaction system

Source: As presented in a short course lecture by Zissis in 1975.

A project driven assessment is one which begins with a specific project plan for a specific purpose, region or area, such as a cool energized power plant on the Colorado River. A technology driven assessment is one which gives consideration to a range of applications and consequences of a total technology, such as the automobile. A problem driven assessment is one which considers a major problem area of technology application, such as life extending technologies, and considers a variety of technologies which can serve a variety of purposes in solving the problem at hand. It is generally easiest to get a full analysis accomplished of a project oriented technology assessment while a problem oriented TA is more difficult due to the fact that there are a multitude of technologies that can come into play. It is a problem oriented technology assessment that is being discussed in this paper.

Seven steps are normally utilized in a technology assessment (Jones, 1971). These include: (1) define the technology task; (2) describe relevant technologies; (3) develop state of society assumptions; (4) identify impact areas; (5) make a preliminary impact analysis; (6) identify action options and; (7) complete the impact analysis. To achieve comprehensive TA's, several iterations through these steps should be utilized.

Conceptual Framework for TA: Human Rehabilitation Techniques

In order to achieve rehabilitation goals one must have a clear understanding of the needs of the disabled population and of barriers to the adequate functioning of the disabled as community members and/or workers. A logical starting point is to analyze each disability group separately on such dimensions as incidence, etiology, major handicap and so on. Nine major headings representing the major types of disability (see Figure 1-2) provide the basis for selecting specific disability groups for intensive case study and data analysis. Clearly some of the conditions are more disabling than others and emphasis was placed on those which result in significant handicap in the ability to function as a member of the community and a member of the labor force.

Nervous System

Stroke - ST
Trauma - spinal cord injury - SCI
Cerebral Palsy - CP
Epilepsy - EP

Mental

Mental retardation - MR
Schizophrenic - Sz

Musculo Skeletal

Rheumatoid arthritis - RA

Cardiovascular

Coronary heart disease - CHD

Respiratory and Related Disorders

Emphysema - EM

Digestive

Colon/rectum - Cancer - CRC

Urogenital

Kidney disease - KD

Endocrine-Metabolic

Diabetes mellitus - DM

Sense Organ

Visual impairment - VI
Hearing impairment - HI

Figure 1-2. Major Disabling Conditions (from *Social Security Survey of the Disabled: 1966*) and Disabilities Selected for Study

A major task of technology assessment in the field of human rehabilitation is to identify those human functions in which the individual experiences the handicap. This can be accomplished best by focusing attention on the human functions regardless of etiological handicapping condition. In analyzing the functional needs of the disabled population, ignoring the handicapping condition, five life functions come to the fore-front--mobility functions, health functions, communication functions, cognitive intellectual functions, and social attitudinal functions. This life function paradigm permits a clear identification of the critical functional needs of individuals labelled with one or more handicaps (see Figure 1-3).

Whatever the disability category, whatever the functional needs of the disabled person, three major types of technology are typically employed in rehabilitation. These three are categorized into those which change the disabled, through physical intervention, or training/counseling, and those which change the disabled person's milieu through environmental change. Technologies of service delivery, while they belong in a large class of technologies which alter the environment of the disabled, are also conceived as distinct from the three major rehabilitation technology classes and, in part, as an alternative to innovation in specific rehabilitation technologies. Thus, service delivery was a related technology which received consideration (see Figure 1-4). These categories were further

1. Health functions. If impaired in this area, the person is lacking the general sense of physical well-being called good health; must devote a large part of his or her energies to staying alive or coping with pain; or must avoid activities which would risk life or well-being. If a condition is controlled the person is not limited in the health functions area. If, however, needs for continuing treatment interfere with living and working, a limitation exists.

Mental health has been deleted from this category so that it more squarely focuses on physical health. Example: heart disease patient.

2. Mobility functions. Limitation in the area of mobility includes difficulty using manual skills to manipulate objects of devices, difficulty locomoting within a living or working environment, and/or difficulty moving from place to place in the community. Example: quadriplegic.

3. Communication functions. If impaired, the person has difficulty sending and/or receiving messages from other persons, either because of impairment in the senses or mechanisms of communication or because the content of communication is deviant (as in the case of the mentally ill). Example: deaf.

4. Cognitive-intellectual functions. The person has difficulty intellectually manipulating symbols and objects, acquiring new cognitions and behaviors, and/or transferring learning to new situations. The impairment can be cogenital or it can be environmentally caused. The mentally ill, and even the alcoholic or drug abuser, may have difficulty learning or transferring learning to new settings. The problem can be slow learning or distorted thought and perception. Example: the mentally retarded.

5. Social-attitudinal functions. If impaired, the person cannot accept himself and his abilities, has difficulty relating to other people, or is not motivated to improve himself as a member of the community or labor force. Impairments may also include deficiencies in "coping skills" which involve recognizing one's self interest and maximizing them within the constraints set by society. Although impairment in this area may be directly caused by society's intolerance or misconceptions, we are concerned only with the way the disabled person feels about himself and relates to others--whatever the cause. This type of impairment may be especially severe for those who suffer a loss due to injury or disease after childhood. Example: paranoia and prostate cancer.

Figure 1-3. Life functions: guide to the meaning of categories

Physical Intervention. Technologies which change the person through physical means, including use of physical devices (e.g., prosthetics), introduction of chemical change (e.g., medicines, dietary programs), or surgical techniques (e.g., transplantation, neurosurgery). These technologies can sustain life, restore functions, or augment functions.

Training/Counseling. Technologies which consists of training, education, or therapy designed to sustain, restore, or augment functioning by altering skills, cognitions, or attitudes.

As with physical intervention, the aim is an alteration in functioning, but it is achieved without physically altering the body and its processes.

Training/counseling technologies include the whole range of academic and vocational education, corrective therapies, and psychological counseling and therapy.

Environmental Change. Technologies designed to change the environment and thereby effect a change in the disabled person's functioning. This class includes the broad areas of community design, design of living environments, alterations in vocational environments, and transportation. The concept of community design is broadly conceived to include changes in both the physical and social environment, e.g., adaptive architecture and community attitude change technologies.

Change in Service Delivery. Technologies which result in a change in the delivery of available rehabilitation technologies or which have independent impacts on the welfare of disabled.

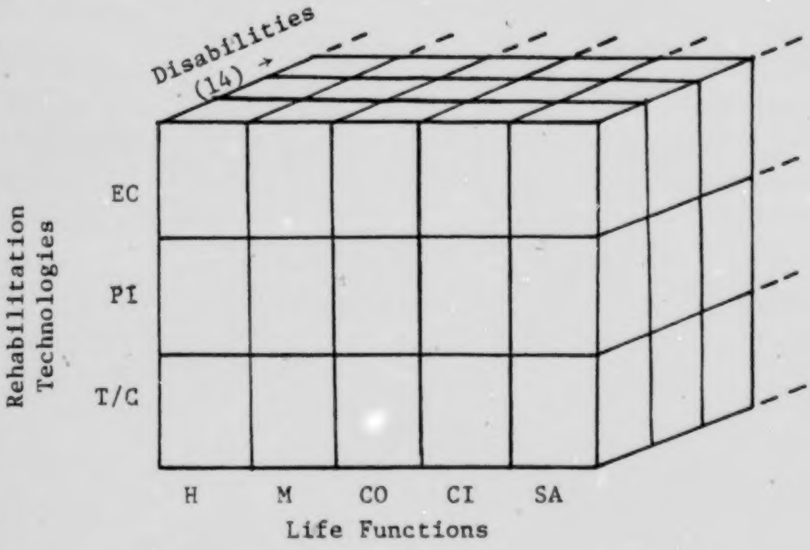
The service delivery system and the technologies within it can be analyzed in terms of management concerns, resource requirements, and technology utilization.

Whether or not rehabilitation technology changes, there are many means by which delivery of rehabilitation services can be changed. Examples of change in service delivery include change in eligibility requirements or definitions of a disability, intra-organizational change in structure and/or function, inter-organizational change in structure and/or function, alteration of flows dollar resources, and changes in the specific agents providing rehabilitation service. Issues which might arise in this area include public versus private sponsorship of rehabilitation, centralization versus localization of service, direct subsidy of disabled individuals versus funding of service delivery components, and consolidation of services for disability groups with related needs versus specialization of service components

Figure 1-4. Rehabilitation technologies

delineated and are discussed under the section General Methodology for TA: Human Rehabilitation Techniques.

The three broad aspects of disability and rehabilitation discussed above form the three dimensions of the conceptual framework utilized in this study, as depicted in Figure 1-5. This framework facilitates three types of analysis: analysis by disability, analysis by life function, and analysis by rehabilitation technology.



Code Key

Rehabilitation Technologies (3)

EC=Environmental Change
PI=Physical Intervention
T/C=Training/Counseling

Life Functions (5)

H=Health
M=Mobility
CO=Communications
CI=Cognitive Intellectual
SA=Social Attitudinal

Figure 1-5. Multidimensional matrix of life functions (5) x rehabilitation technologies (3) x disabilities (14)

General Methodology for TA: Human Rehabilitation Techniques

Utilizing the framework discussed above, the general methodology which was used in the TA of human rehabilitation techniques is depicted in Figure 1-6. The following discussion elaborates the primary steps.

Conceptual Framework

The general conceptual framework developed and used within this TA was presented earlier. The review process of the conceptual framework as shown in Figure 1-6 was conducted in conjunction with the review of the overall strategy underlying the general methodology.

Data Gathering and Model Development

One of the basic efforts of the project was to bring together the required data relative to the selected disabilities, the life functions involved and the rehabilitation technologies. The data relative to the selected disabilities were compiled by way of individual disability reports for those disabilities/diseases listed in Figure 1-2. This data was then aggregated within a life function report. A rehabilitation technology data base was developed and culminated in a technology report analyzing the technologies presently being used in the rehabilitation of disabled, as well as giving consideration to those technologies that are under development at present, those that appear to be promising for the future, and those which can be transferred

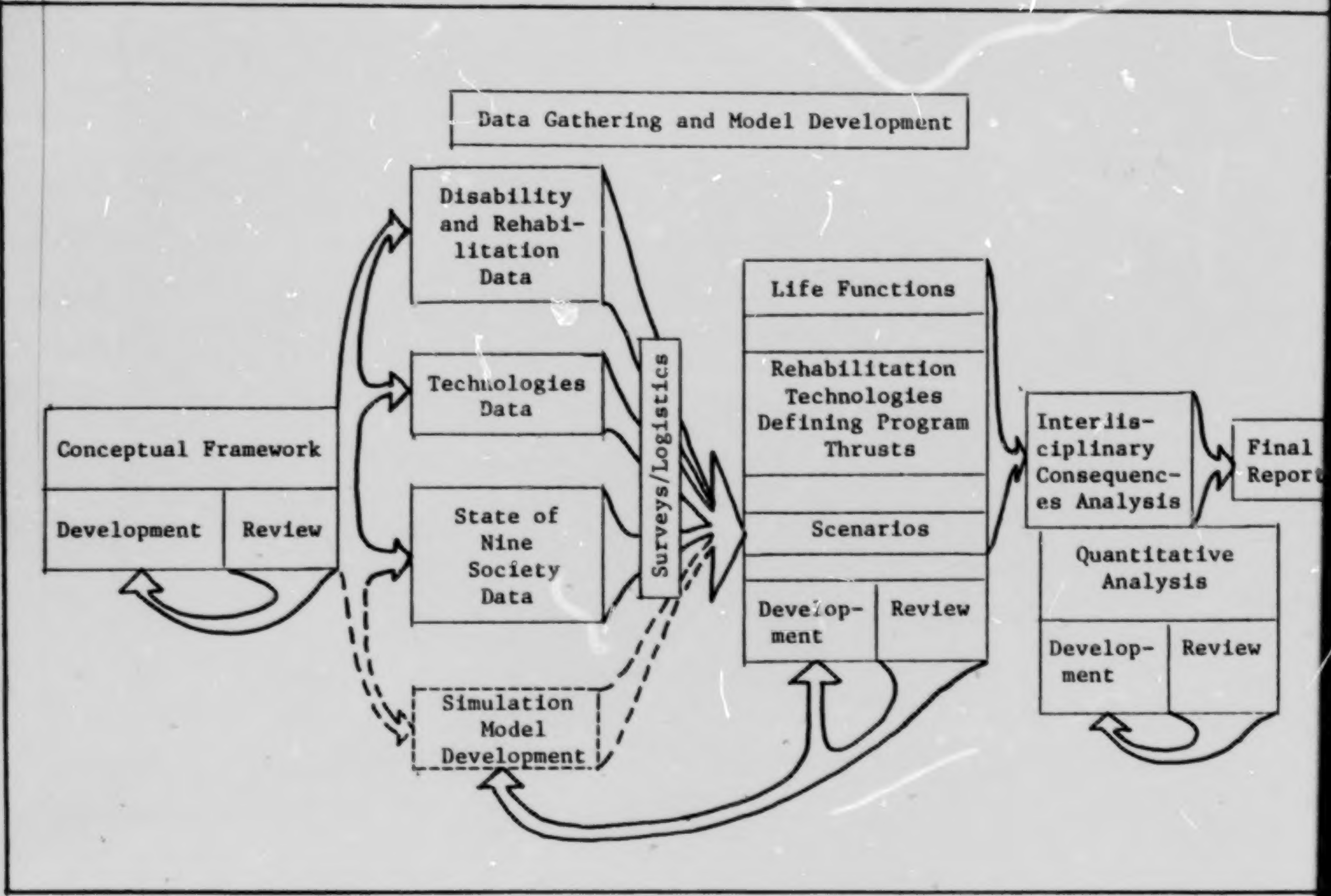

Data Gathering and Model Development
Disability and Rehabilitation Data
Technologies Data
State of Nine Society Data
Simulation Model Development
Surveys/Logistics
Conceptual Framework
Development
Review
Life Functions
Rehabilitation Technologies Defining Program Thrusts
Scenarios
Development
Review
Interdisciplinary Consequences Analysis
Quantitative Analysis
Development
Review
Final Report

Figure 1-6. General methodology

from other technological fields. Additionally, experts were contacted to develop special reports relative to housing, education, income and income maintenance, transportation problems, as well as special reports on the economic, legal and legislative aspects of disability.

Parallel with this effort, a state of society report was developed. Two broad categories of variables were considered in the development of state of society assumptions. The first relates to those variables that provide a description of the societal system (society) in general, and the second relates to those variables that qualitatively describe the rehabilitation system itself. In obtaining quantitative measures for many of the first category of variables the project used those measures developed in other technology assessments, other related studies or from government projections. These variables deal with historical data and projected estimates of the general population figures, economic growth, taxes, income, etc. It was felt that there was very little, if any, need for this project to duplicate the efforts of others in these areas. Thus, efforts were concentrated on the development of the second category of variables, those relating to the rehabilitation system. These variables included such things as the size of the disabled population; the amount of public funding devoted to social programs in general and to disability programs in particular; percentages having no major handicapping need, partial handicapping need, and total disability need; trends in the growth of the disabled population; the life functions affected, etc.

Upon completion of the description of the historical trends resulting in present state of these variables, projections were used to develop scenarios to describe a range of possible futures. Three scenario groups were developed based primarily on the general societal variables within which the problems associated with disability exist. One scenario group assumes a somewhat steady state of growth in general prosperity wherein the major historical trends are projected into the future. The second group depicts an accelerated growth picture for general prosperity which may come about if general prosperity is increasing. The third group depicts a reduced growth rate in general prosperity (when compared to the first group).

The model development phase originally consisted in providing the conceptual setting in which the dynamics resulting from various activities within the different scenarios could be analyzed. The complexity of interactions comprising these dynamics led to the decision to develop a basic computer simulation model. This model was designed to integrate the major variables describing both the general societal conditions, the variables associated with the problems of disability and rehabilitation and other variables considered to be affected by alternative strategies of rehabilitation; and to display the consequences that could or would occur over time under the varying conditions of the scenarios. Moreover, the model was to assess the major impacts upon the larger societal system involving the economy, the environment and the general welfare of the whole of society. This approach forced a comprehensive consideration of the dynamic structure and had the ability to reveal secondary consequences which may have been considered far removed from the immediate direct affects on the disabled population, or could contribute to unintended affects on total society. In short, it was anticipated that these simulation studies would corroborate the other activities of the project in some very important respects.

Supporting all these efforts was the development and administration of various surveys to specific groups of individuals such as advocacy groups, rehabilitation centers, etc. for specific information relative to the areas under development. Additionally, procedures were developed for the conduct of a literature search and review along with those for obtaining topic papers, other expert testimony, and work session participants.

Rehabilitation Program Thrusts

In the early stages of the project, consideration was given to various procedures which would aid the consequence analysis of rehabilitation techniques and which, in turn, would provide a further framework for a coherent, comprehensive method of all data reporting. Since it was deemed impossible, due to the time limitations of the project, and less meaningful for an overall analysis to subject very specific rehabilitation technologies to consequence analysis over time, it was decided that groups of related rehabilitation technologies would necessarily have to be considered--a specific group of related technologies was then named a "program thrust." To accomplish this the three basic categories of rehabilitation technologies and the related technology of service delivery were developed within hierarchical levels and tree diagrams showing the hierarchies are presented in Figures 1-7 through 1-10.

The diagrams initially were developed by the research team utilizing brainstorming and a modified delphi procedure. These diagrams were then subjected to review by eight individuals with knowledge of rehabilitation and upon completion of this step were adopted for use in the project. These diagrams, while not being offered as necessarily complete, did establish a base from which to conduct the consequence analysis and a coherent, comprehensive format for data reporting. The three diagrams of the three basic rehabilitation technologies depict successive series of subclassifications, or groups of technologies, designed to assist or enable the diabled individual to enhance the realization of specific life functions. Each lower level (read from left to right) within the tree, specifies in greater detail those technologies which can be used and/or have the potential for being used in rehabilitation efforts. Those successive levels between the basic rehabilitation technology and the level at which the analysis is to be conducted were referred to as the program thrust. Those levels to the immediate

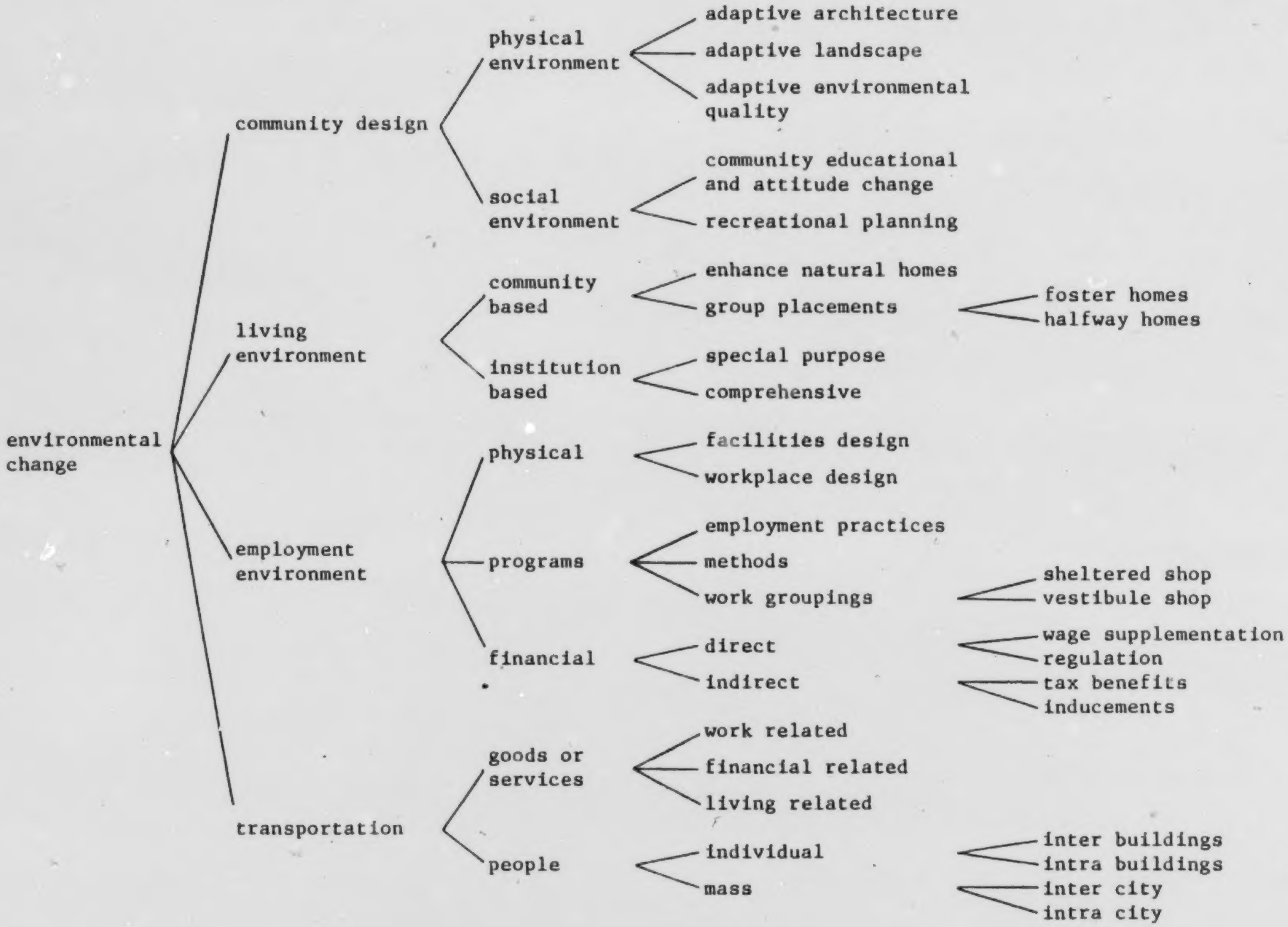

environmental change
community design
physical environment
adaptive architecture
adaptive landscape
adaptive environmental quality
social environment
community educational and attitude change
recreational planning
living environment
community based
enhance natural homes
group placements
foster homes
halfway homes
institution based
special purpose
comprehensive
employment environment
physical
facilities design
workplace design
programs
employment practices
methods
work groupings
sheltered shop
vestibule shop
financial
direct
wage supplementation
regulation
indirect
tax benefits
inducements
transportation
goods or services
work related
financial related
living related
people
individual
inter buildings
intra buildings
mass
inter city
intra city

Figure 1-7. Tree diagram: technology levels for environmental change

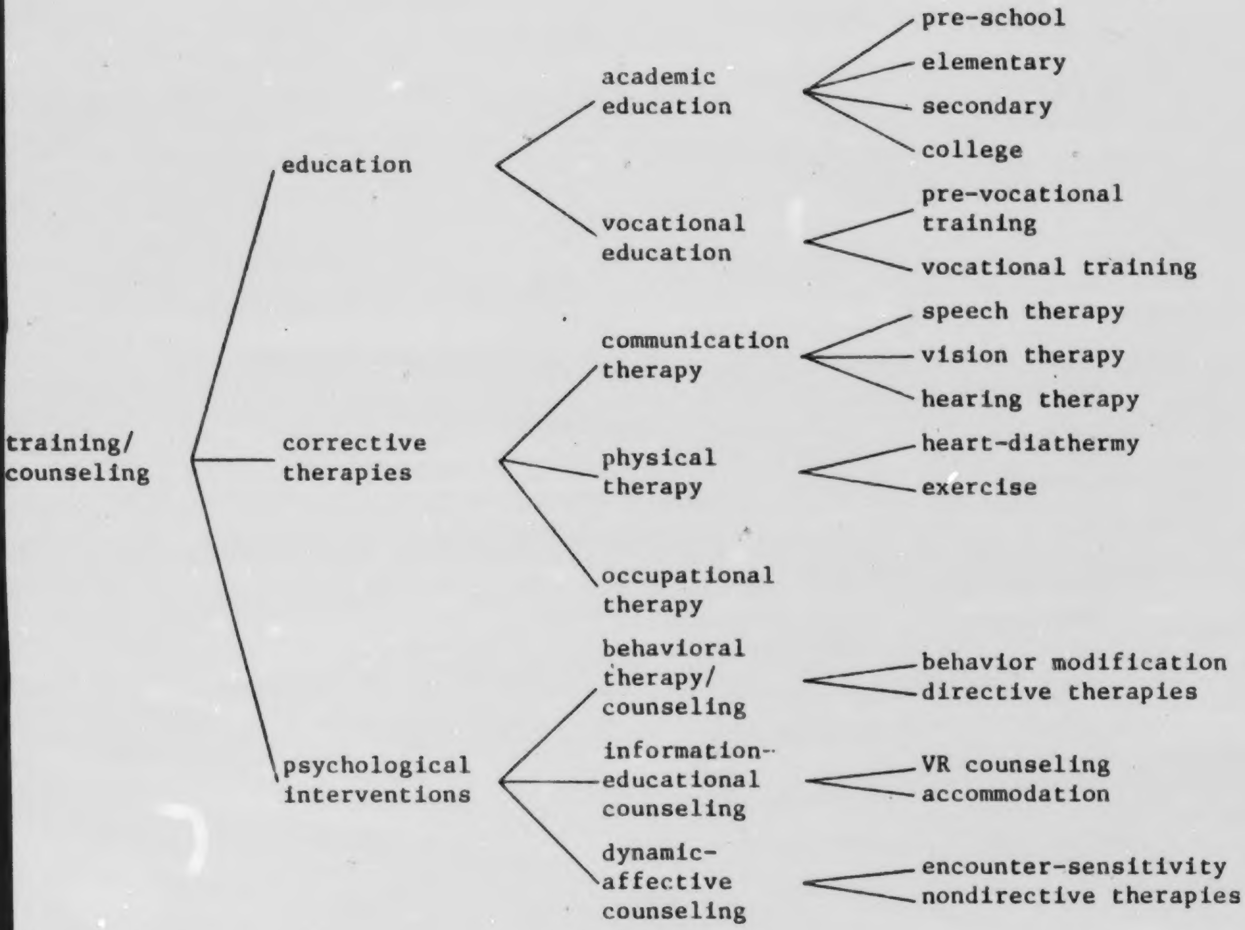

training/
counseling
education
corrective
therapies
psychological
interventions
academic
education
vocational
education
communication
therapy
physical
therapy
occupational
therapy
behavioral
therapy/
counseling
information-
educational
counseling
dynamic-
affective
counseling
pre-school
elementary
secondary
college
pre-vocational
training
vocational training
speech therapy
vision therapy
hearing therapy
heart-diathermy
exercise
behavior modification
directive therapies
VR counseling
accommodation
encounter-sensitivity
nondirective therapies

Figure 1-8. Tree diagram: technology levels for training/counseling

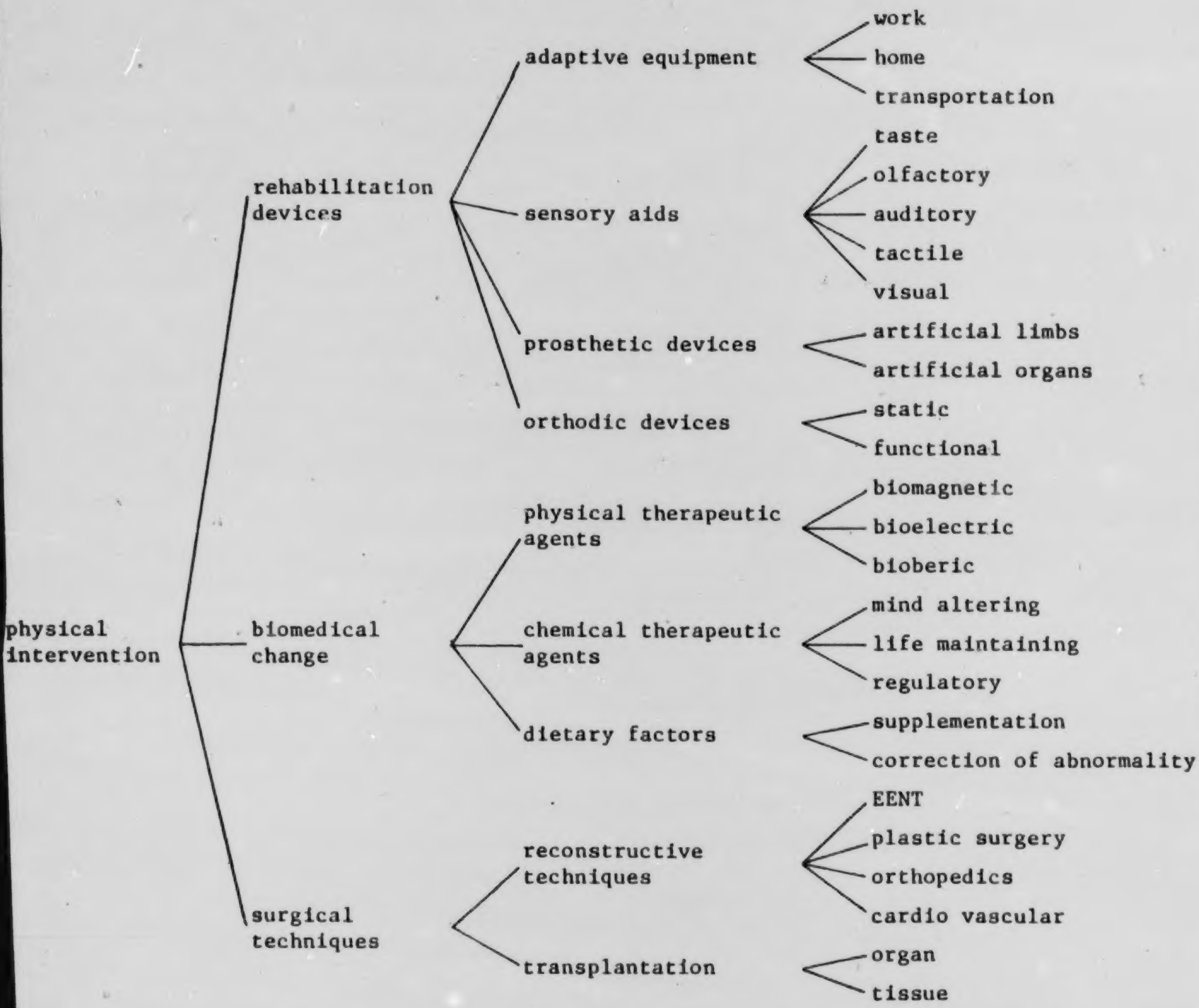

physical intervention
rehabilitation devices
adaptive equipment
work
home
transportation
sensory aids
taste
olfactory
auditory
tactile
visual
prosthetic devices
artificial limbs
artificial organs
orthodic devices
static
functional
biomedical change
physical therapeutic agents
biomagnetic
bioelectric
bioberic
chemical therapeutic agents
mind altering
life maintaining
regulatory
dietary factors
supplementation
correction of abnormality
surgical techniques
reconstructive techniques
EENT
plastic surgery
orthopedics
cardio vascular
transplantation
organ
tissue

Figure 1-9. Tree diagram: technology levels for physical intervention

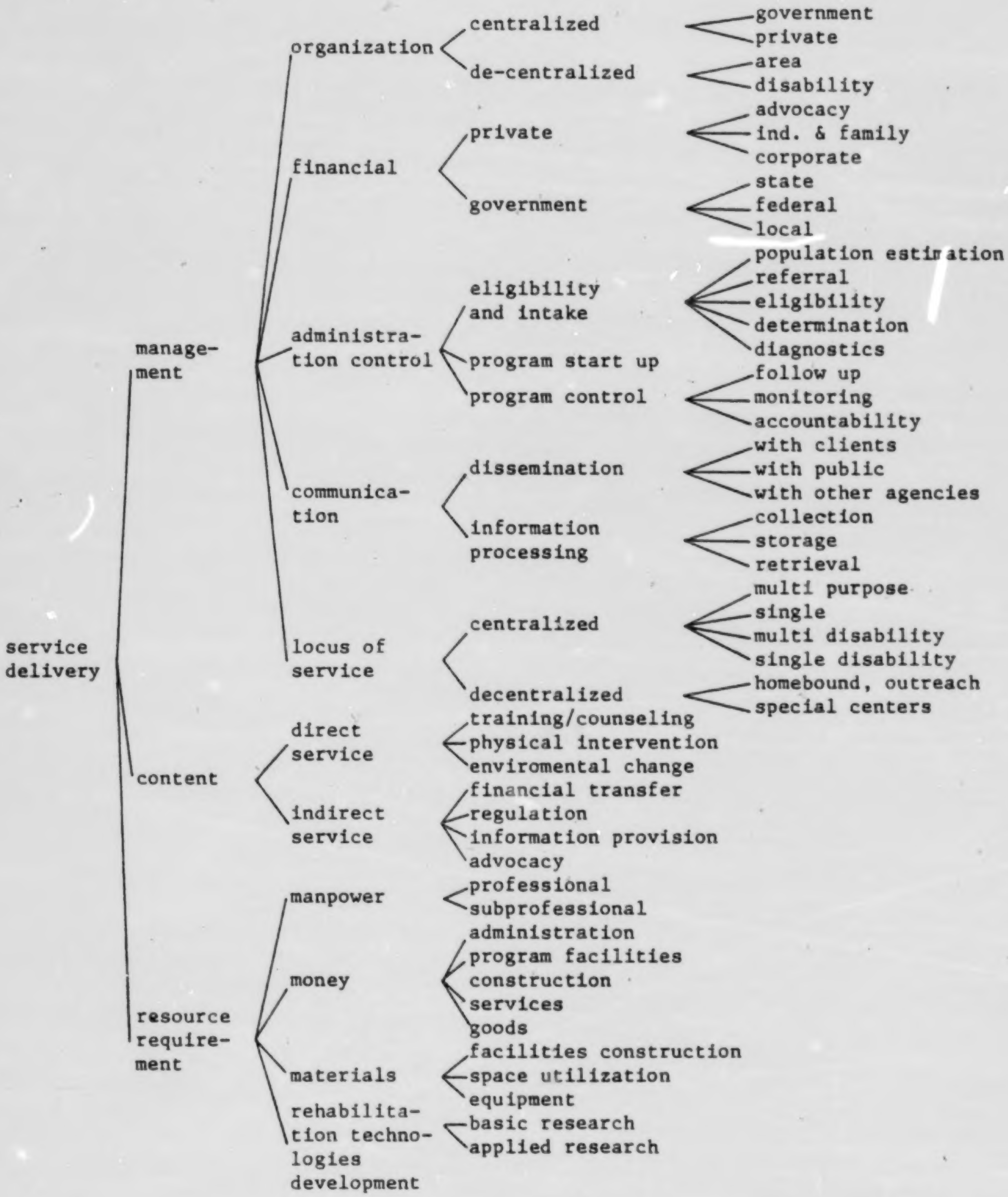

service delivery
management
organization
centralized
government
private
de-centralized
area
disability
financial
private
advocacy
ind. & family
corporate
government
state
federal
local
administration control
eligibility and intake
population estimation
referral
eligibility
determination
diagnostics
program start up
program control
follow up
monitoring
accountability
communication
dissemination
with clients
with public
with other agencies
information processing
collection
storage
retrieval
locus of service
centralized
multi purpose
single
multi disability
single disability
decentralized
homebound, outreach
special centers
content
direct service
training/counseling
physical intervention
enviromental change
indirect service
financial transfer
regulation
information provision
advocacy
resource requirement
manpower
professional
subprofessional
money
administration
program facilities
construction
services
goods
materials
facilities construction
space utilization
equipment
rehabilitation technologies development
basic research
applied research

Figure 1-10. Tree diagram: technology levels for service delivery

right of the program thrust delineate the strategies and/or alternative methods of accomplishing the program thrust. For example in Figure 1-7 a program thrust within environmental change could be identified as consisting in the environmental change level to the level entitled community based. This program thrust would pass through the level of living environment. Thus, a policy maker when considering a community based living environment for the disabled (the program thrust) would have available two distinct alternative strategies, namely the enhancement of natural homes (single or multiple units, not shown here) or group placements (foster homes, halfway homes). Various combinations of these two strategies would provide for additional strategies.

The structuring of the rehabilitation technologies in this manner provides a powerful analytic tool when considering a specific program thrust in that the scope of the specific analysis can be reduced to manageable size by excluding topics outside the scope of the alternatives but noting the requirement to consider the topics within a total concept of rehabilitation. By limiting the scope in this manner, the analysis of the various strategies associated with a specific program thrust can be more readily accomplished.

The advantage may be clarified by referring to the previous example of the program thrust of a community based, living environment within the environmental change tree (Figure 1-7). Although other factors such as the employment environment are very important problems within the total rehabilitation system, extensive concern for these problems would only complicate the task of analyzing the various alternatives available to the policy maker. Once the advantages and/or disadvantages of the various alternatives are considered in their own right, they can subsequently be considered in conjunction with the other factors and other program thrusts.

The tree diagram for the related technology of service delivery (Figure 1-10) would appear to be somewhat different. Service delivery was previously identified as a related technology extending across the three basic rehabilitation technology categories. These basic categories are shown within the service delivery tree diagram as the alternatives to the program thrust commencing at the service delivery level then through the content level and terminating at the direct service level. A companion (or alternative) program thrust which would include the content level within the tree could terminate at the indirect service level. The various alternatives or combination of alternatives available in this case consist of financial transfer, regulations and information provision. The alternative strategies available for both the direct and the indirect service program thrusts require that consideration be given to both the management of and the resource requirements for the rehabilitation system.

In addition to the projections of the future shown within the scenarios, the computer simulation model and the rehabilitation program thrusts, other aids to the analytic process were developed. The data dealing with the five life functions, gathered during the development of the individual disability reports, was formulated into hierarchies within each of the life functions. These hierarchies are shown in the life functions paper within this volume.

The various activities conducted during the initial data gathering and model development phase produced working papers in three primary areas in addition to several related and/or supporting areas. The working papers within the primary areas dealt with the life functions, rehabilitation technologies, and general scenarios for society. The working papers within the related areas dealt with the conceptual framework of the project, abstracts of the contracted special topic papers, related data, possible related issued, and computer modelling for technology assessment. All the working papers were submitted to review by members of the oversight committee in addition to other experts in order to bring a greater number of views into this important consideration of the future. The review comments brought about some changes within these papers.

The revised working papers served as the principal documents designed for use during the subsequent phase of this technology sequent phase of this technology assessment.

Interdisciplinary Consequence Analysis

A week long interdisciplinary consequence analysis work session was conducted at Texas Tech University during July,

1976. The material developed during the previous phase had been forwarded to the participants approximately three weeks prior to the work session.

The work session format placed primary concentration on the activities of the participants within four working groups, one group for each of the basic rehabilitation techniques and one for the service delivery technology. Plenary sessions were scheduled to promote interaction between the groups while the individual participants were encouraged to hold additional intergroup discussions. The work groups performed the task of considering the various consequences, effects and impacts of each of seven program thrusts identified for assessment and depicted in the tree diagrams indicated earlier. The objective was to anticipate the influence on society of efforts of human rehabilitation techniques with greater comprehension and confidence. This was carried out under the assumption that rehabilitation has the goals of improving the life style of the disabled and integrating the disabled into a community and/or into work force, by developing or improving the appropriate life functions. The influences or effects on total society were assessed in terms of societal benefits and disbenefits, both for the disabled and non-disabled populations; interactions with other technologies and programs; and the deliverability of the technologies. The work session groups were also requested to make some estimation of the extent or degree of the effect, such that some quantitative estimates could be made for each program thrust that was considered in the analysis.

The results of the efforts of the group work sessions were reported during the final plenary session. These reports were subsequently reviewed by the leaders of each respective group prior to completion. The relative estimates used within the simulation model during the work sessions were verified and/or augmented as appropriate with additional data following the work sessions.

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SOCIAL CONTEXTS OF HUMAN REHABILITATION: PAST, PRESENT AND FUTURE

Introduction*

This technology assessment (TA) examines the impacts and consequences upon society of techniques used in support of the disabled in American society. All of the techniques have a primary objective of effectively reducing the size of our disabled population through integration of disabled individuals into the community and if possible into the workforce, and thus, making their lives fuller and happier.

[*and benefiting "society" too.*]

The primary objective of the various rehabilitation programs fit into three basic classifications according to the technology they employ, each with various "program thrusts" as described in Project Paper 1, including rehabilitation techniques based on (1) environmental change, (2) physical intervention, and (3) training and counseling. A fourth technology, intimately related to these rehabilitation technologies, is that of service delivery.

As various programs are used to achieve objectives in reducing the number of disabled persons through rehabilitation, they concurrently produce impacts on society as a whole. In general, the programs require resources from the entire society, thus these programs impact on and have "consequences" for the nondisabled persons as well as the disabled and they may reduce the resources available to meet other objectives within society. Likewise, some programs impact or have consequences which improve society's general well being. Similarly, programs for meeting social objectives outside the rehabilitation domain limit resources available for rehabilitation programs. Such interaction between the disabled population and the entire society is both an extremely important and an extremely complex relationship which must be accounted for in assessing future impacts and consequences of rehabilitation technology.

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*This project paper contains both original text presented to work-session participants and (in italics) responses they gave to the text.

To permit ordered examination of possible roles that rehabilitation technology may play in the future of American society, the interactive relationships must be carefully observed and described. The observable trends from the past and present can serve as rails of inference leading into the future. Moreover, they also include a mechanism for recognizing social characteristics and events which may occur or develop in the future despite our lack of inference with which to project them from the past. Economic boom or depression, war, technological breakthrough, and rapid political change are among many other social characteristics and events which may also shape the role of rehabilitation technology within society in the future.

[*developmental constructs.*]

The complex disposition of American society, in this TA, is presented by descriptive scenarios--literally, "plot outlines"--of the future. A most probable scenario group describes certain events and characteristics likely to occur according to projections from the past. Two other scenario groups establish plausible limits of possibility in the future of American events and characteristics with respect to the primary objective of rehabilitation; the first describes an accelerated growth in funding for social needs and effectiveness of foreseeable rehabilitation programs, and the second describes a reduced growth in funding for social needs and effectiveness of rehabilitation programs. Within these three scenario groups, various possibilities for the future of rehabilitation technology will be analyzed.

Issues, Problems, Policies and Solutions Within Society

This problem oriented TA deals specifically with the problems and policies related to the area of human rehabilitation. In order to provide a common understanding of terms for use in the project work sessions and to highlight various concepts which will have an influence on the consequence analysis of various program thrusts, the following brief discussion relative to issues within a society is presented. A general relationship is presented in Figure 2-1 indicating that the problem may

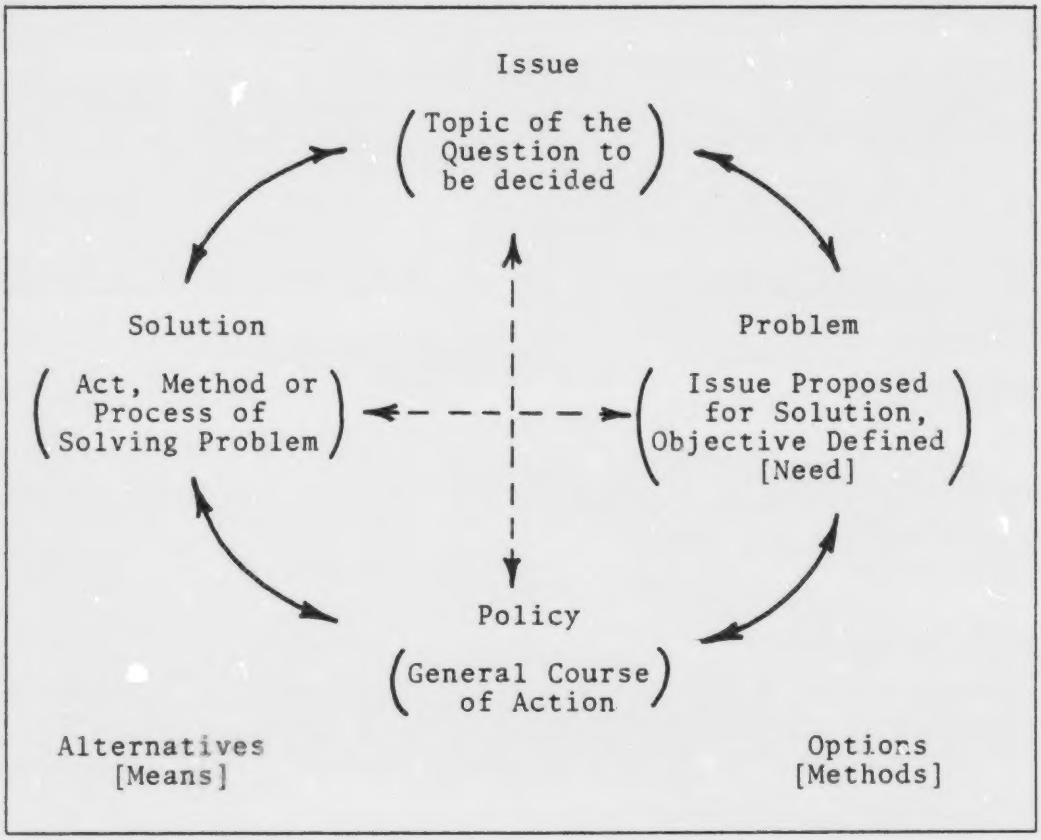
Issue
(Topic of the Question to be decided)
Solution
(Act, Method or Process of Solving Problem)
Problem
(Issue Proposed for Solution, Objective Defined [Need])
Policy
(General Course of Action)
Alternatives [Means]
Options [Methods]

Figure 2-1

emanate from an issue.* Consideration of the problem leads to a defined objective which in turn leads to an adopted policy after various options or methods of approach are considered. Upon the consideration of alternative means, a solution may be obtained. It should be noted that an issue may surface in various ways; in fact, a certain solution selected at one point in time may become an issue at a later point in time.

*[*In federally managed rehabilitation resources; problems spring from perceiving a barrier to implementing policy. Is this what an issue is?*]

A problem may be defined as one or more "needs" that are considered for solution while each "need" is identified as the difference or gap between "what is" and "what could be" or "what should be." Although defining a specific problem in these terms may appear to be a relatively easy task, experience teaches that this is generally not the case.

Several questions are encountered in defining problems. The first question may occur in obtaining agreement in identifying the "what is" of a current situation in that the present is not always perceived with unanimity. The second question may be encountered in defining the "what could be" or "what should be."

[*The second question - much harder to obtain agreement.*]

It should be noted here that even if agreement is reached on the "what could be" or "what should be," this does not require that those agreeing are doing so for the same reasons.

It is very possible that agreement can be reached due to very different or even opposite reasons.

[*delete last statement*]

Given that an agreement can be reached on the "what is" and the "what could be" or "what should be," a third question may arise. This question deals with establishing the relative priority any one "need" should have in relation to various other "needs." It may be safe to say that many individuals have had to answer these questions when attempting to identify personal "needs" and subsequently establishing the relative priorities of the needs that they may have identified.

It is assumed here that, at least on the individual level, decisions are generally based on some value judgements either rational or emotional. Initially the value judgement may be used in defining the "what is" only if in terms as something that should not be. Actions taken under these conditions often result in adversity. If the "what should be" is measurably identified, again based on some value judgement, the individual has at least established some direction and the progress in achieving an objective can be measured. Due to the fact that often times an individual is faced with problems competing for action, the individual may find it necessary to establish priorities among the various problems.

As the number of individuals involved in this process increases thereby forming a society, it is very likely that the magnitude of the difficulty in answering the above questions increases also. If the numerical size of the population is relatively small, i.e., a family, the difficulty in establishing a value judgement upon which to base a decision may be minor.

[*May also be major in light of divergence of generation gap.*]

As the society in question increases from family size to include neighborhood, to the community, to the entire population of the nation, the difficulties encountered differ only in complexity and magnitude. The value judgements made at these various levels are referred to here as "common value judgements." This designation, i.e., "common," does not mean that the value judgement represents the value judgement of all the individuals involved or even the majority of those individuals.

For the purposes here it is assumed that "common" value judgements affecting society are established within two interrelated and interdependent subsystems within the social system. The first of these two subsystems is the cultural subsystem. The "common" value judgements influencing the decisions and thus the actions of the members of society within the cultural subsystem usually take an unwritten form and are generally referred to as customs and courtesies. It should be recognized that in any large society there may exist many subcultures each with its own set of customs and courtesies. The second of these two subsystems is the political subsystem. The "common" value judgements within a political subsystem generally take a written form commonly referred to as laws, statutes or policies.

The set of common value judgements established within a subculture within the cultural subsystem may be no less binding on the individual than the set established within the political subsystem. On many occasions a violation of the subcultural values of a group may be dealt with more harshly than a violation of the politically established values of society.

Many common value judgements that originated within the cultural subsystem may find their way into the set of political common value judgements. Thus, a review of the political subsystem of a society within a specific area, may possibly be used to establish trends relating to society's formalized identification of "needs" and the priority given to providing solutions to the various problems in relationship to the other problems of society.

If a problem has, in fact, been identified as the measurable difference of gap* between "what is" and "what should be," then a solution can be generally defined as a measurable reduction in or the elimination of a problem. This definition requires action concerning not only the identification of those methods available that can measurably reduce or eliminate a problem but also the selection and implementation of the means capable of achieving the solution.

[*either actual or perceived.*]

As used here, the consideration of "method" leads to the establishment of, or a change to policy and procedure which may be employed in obtaining a solution whereas the consideration of "means" specifies the resources used in obtaining a solution. A method in obtaining a solution may consist of altering the constraints upon a problem. For example, in the definition of a problem, the "what should be" can be set equal to the "what is," thereby eliminating the problem. It may also be possible to change the common value judgements, i.e., rules or laws pertaining to the problem. In defining the "means" in terms of the resources utilized in obtaining a solution, the reference here is to those factors which are commonly referred to as economic resources.

[*What about the economic subsystem?*]

Just as in the case of the cultural and political subsystems, the actual distribution of the economic resources and the relative authority exercised within this subsystem do not necessarily express the desire of the majority of society. As individual or societal value judgements shift; whether due to changes in customs, growth, or special interest groups influence; new problems are identified. The utilization of means in providing solutions to these problems often requires various shifts in the distribution of allocatable resources. It may be considered sufficient to many to simply state that society in general is faced with a myriad of needs both public and private. Further it is generally acknowledged that the allocatable resources available to solve these many problems are limited in one form or another. The economic subsystem then can be considered to be concerned with the development and distribution of a society's allocated resources.

A Perspective on the Issues of the Disabled Population

The questions in defining the problems associated with the issues of a population of physically or mentally disabled or disadvantaged individuals are quite similar to those encountered in defining most other complex social problems. Most all individuals within society possess some degree of the basic human faculties. In general, these provide the individual with the ability to perform human functions. If the resulting ability to perform human functions were to be measured on an appropriate scale, e.g., 0-100, various individuals would have differing measures of ability. In many cases some level of ability is used as the criteria to differentiate between impaired and non-impaired individuals. For the purposes of this TA an individual with an impairment that has either been eliminated or corrected, e.g., through the use of eyeglasses, has been included in the non-impaired or able population. Thus, the general "what is" of the problem is that within the American society, consisting of approximately 214 million individuals, there exists a subpopulation of individuals who, due to some physical or mental impairment either are limited in their ability to perform certain types or amounts of human functions or do not have the ability to perform at least a minimum of normal human functions. Within this subpopulation, those who are limited in their ability to perfrom certain types or amounts of the normal human functions comprise a further subpopulation referred to as the disabled, whereas those who do not have the ability to perform a minimum of normal human functions are referred to as the handicapped. Figure 2-2 depicts a classification scheme based on their conceptual distinctions.

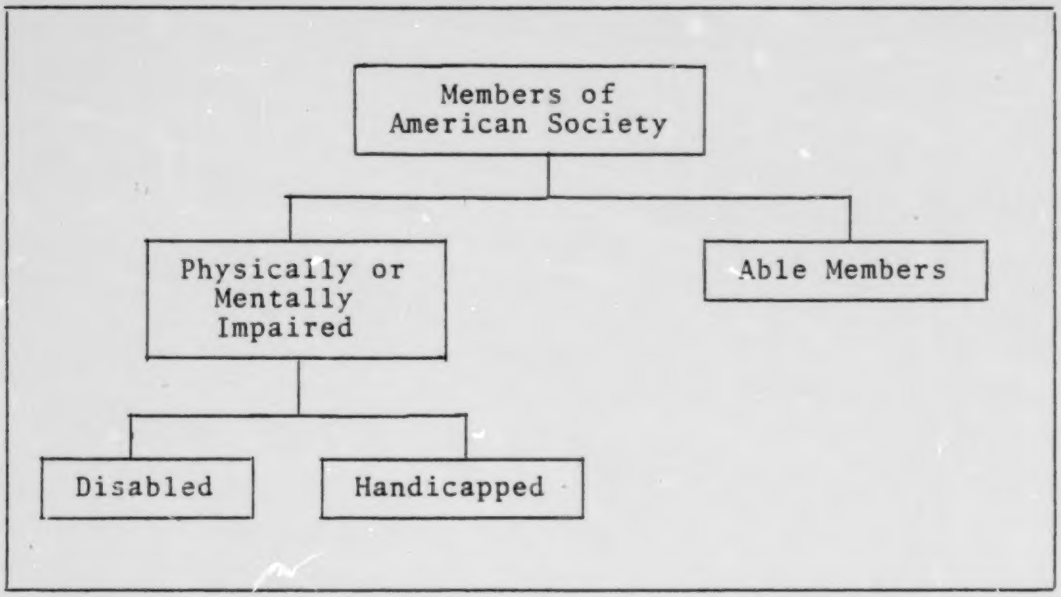
Members of American Society
Physically or Mentally Impaired
Able Members
Disabled
Handicapped

Figure 2-2. A classification scheme for members of society.

This general connotation would appear to be supported by some of the various definitions of disability as found in the literature. For example, James Garrett[1] states that "...disability is defined as the inability to perform a certain role." This TA deals with the issues and problems of both the disabled and the handicapped. For ease of reference this subpopulation will be referred to as the disabled population.

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[1] Garrett, James F. "Handicapped Americans--Overview," American Rehabilitation, May/June, 1976.

It could be argued at least in general terms, that the "what should be" of this problem could be stated in terms that there would be no disabled population. This could be achieved by restoring the ability or correcting the impairment of the individual members of this population, thus, enabling them to move to the able population at least definitionally as in the previous example wherein the individual with impaired vision, who through the use of eyeglasses, was considered within the able population. However, sufficient empirical evidence exists that would tend to support the position that a subpopulation of disabled will continue to exist at least within the 50 year time frame used in this TA.

Any given set of criteria used in defining normal activities may be considered arbitrary depending on individually held viewpoints. Even if agreement could be reached in defining normality, thereby establishing a common "what is" concerning the issues, it may be possible that perhaps some fatalistically oriented members of society would consider that the "what should be" is equal to the "what is." To these members of society, the disabled population would pose no problems within society. However, the majority of society apparently considers that the existence of a disabled population does pose many problems within society.

In viewing the problems connected with the existence of a disabled population it may be helpful to at least estimate not only the total size of this population but also the size of the various groupings that could be formed based on the normal activities affected through the disability or handicapped. Table 2-1 outlines a few of the affected activities along with some general parameter of the individual problems.

It is assumed here that, due to the technicalities of the terms used in defining the disabled and handicapped, many individuals included within this total subpopulation will continue to remain so indefinitely. If one were to address a single characteristic of the disabled population in order to define a specific objective of rehabilitation the characteristic could well be its size. The major objective of rehabilitation could then be stated as the measurable reduction or elimination of the size of the disabled population. One method of achieving this overall objective would be to assimilate or integrate the disabled into society as functioning members and if possible, into the workforce. This could be accomplished through the identification and achievement of many subobjectives such as the restoration* of skills, secondary prevention, etc., as represented by the program thrusts.

[*Does this reduce size? It is the definition of rehabilitation.*]

Once the present size of the disabled population is identified under current definitions, its future size will be determined by the number of individuals entering this population in relation to the number leaving this population.

Individuals may enter this population as a result of various natural and social causes. They may also enter through an expansion of the definitions of disabilities. Many also

TABLE 2-1

Views of the Problem: Normal Activities Affected

Issue[1]	Numbers affected	Problem[2]	Aspects of the "what is" and "what should be"
Transportation* Community and extended locomotion		Lack of access to mass transportation facilities	"Almost totally neglected by all federal agencies are the transportation problems of persons with multiple and severe disabilities."
			"Federal programs for meeting transportation needs of persons with disabilities are piecemeal, fragmented, incomplete, and inadequate."
	13.4 million		"Federal support of training programs must be increased if persons with disabilities are to increase their ability to effectively use transportation modes."
	2.4 million		"...have difficulty with some or all of the following functions related to reaching, handling, and grasping, passing through turnstile, opening vehicle doors, lifting baggages, grasping overhead supports, using hand rails, and handling small change."
	5.2 million		by 1985 "...citizens will be unable to change levels under their own strength."
			"The major problems ...are costs of obtaining services, availability of services, physical demands made on passengers by the design of transportation facilities and equipment, and comprehension and understanding as to when... services are appropriate and adequate."
			"The availability of accessible transportation affects directly the quality of life"
			"There are too many loopholes, too many ways local government can cite their commonly shared fiscal shortfalls and not do justice to the intent of these proposed rules."
			"UMTA is reluctant to encourage manufacturers and require transit authorities to immediately utilize exciting technology to solve transportation problems of the disabled."

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[1] *[Issue - offen this term means difference of opinion. How about area of concern or context or something like that?]*

[2] *[Problem can you indicate the "gap"?]*

Issue	Numbers affected	Problem	Aspects of the "what is" and the "what should be"
			"The FAA underlying assumption is 'that handicapped persons will cause most, if not all, of the difficulties in an emergency evacuation of an airline'."
			Litigation
			"...constitutional principles guaranteeing freedom of movement and equal protection, require federal and local transit authorities securing federal funds to provide accessible services."
			"...the legislation in question is nothing more than a broad, non operative statement of national policy, requiring little more than the present research and demonstration programs... There is no constitutionally guaranteed right to accessible transportation and that whatever services disabled persons receive will be entirely at the discretion of America's transit policy makers."
Education**		lack of development due to lack of access to proper Education.	"A recent survey by Metz... estimated that... ten percent of the children were handicapped. ...only 63 percent of these received one or more specialized services ranging from separate classrooms to individual instruction."
	8.7 million 4.7 million 2.9 million		"Using an incidence estimate of ten percent handicapped, a total of... handicapped children would need and have a right to publicly supported educational services by 1980. This would be a sizeable increase over the ...school age handicapped children in 1970 needing special services and a quantum leap over the estimated 62 percent of...[those] who were receiving them in 1970.
			"A recent report from BEH indicated that only 25 percent of the handicapped graduating from school will get adequate employment. Another 40 percent will be significantly underemployed and 35 percent will be under the care of social services without employment."
			"One well known conservative contender for the presidential post has suggested cutting Federal spending in the area of special education by $6.9 billion."

Table 2-1 continued

Issue	Numbers affected	Problem	Aspects of the "what is" and "what should be"
			"Governor Edward Brown, Jr., of California... stated '...we are entering an era of limits... It's now a question of reordering priorities and choosing one program over another, based on a vigorous standard of equity and common sense'."
			"Other steps should be taken in order to effectively utilize the budget and to satisfy the two important objectives of (1) assuring equal access to programs and (2) achieving maximum efficiency in use of resources."
			Litigation
			"Predominantly class-action in nature, the litigation has focused on three major issues: the right to education; the right to treatment, and the use of inappropriate procedures for the classification and placement of children with special needs."
			"...the court declared that insufficient funds were not an excuse for noncompliance when... stated, 'the inadequacies of the District of Columbia public school system, whether occasioned by insufficient funding or administrative inefficiency, certainly cannot be permitted to bear more heavily on the exceptional or handicapped child than on the normal child'."
			"... By stating that such programs must be made available to all children, '... no matter how seriously or extensively they are retarded', the court eliminated the severity of a child's disability as justification for non delivery of services."
			Litigation
			All Handicapped Children Act (PL 94-142)
			"The act establishes a formula in which the Federal governments makes a commitment to pay a gradually - escalating percentage of the national average expenditure per public school... This percentage escalates to a 40 percent level in 1982 and remains through subsequent years.

Table 2-1 continued

Issue	Numbers affected	Problem	Aspects of the "what is" and "what should be"
			"This law has far reaching implications not only for education of the handicapped but also for shifting balances of powers among Federal, state, and local levels. Such rearrangements could result in a backlog. This would leave the school district without the monies and the Federal government without impact in this much needed area. Heated debates on issues raised by this Act are likely to continue for some time to come."
Employment***	6-7 million	Lack of opportunity to become self-supporting	possible factors right to work discrimination in hiring practices safety of employment environment lower productivity more costly
Independent living		Lack of freedom from financially related living conditions.	possible factors right to quality life independent of costs excessive costs disincentive to be rehabilitated
Barrier free housing		Lack of proper design in general housing	possible factors right to living location right to all types of dwellings costs costs

Table 2-1 continued

All quoted material came from the following papers written for this T.A.

*Transportation Problems of Persons with Disabilities: The Federal Response. Researched and prepared by E. Clark Ross, March 1, 1976.

**The Futures of Public Education and the Handicapped. Ron Wiegernik and Vincent J. Feudo.

***The Employment, Independent Living and Barrier Free Housing are presented as examples of other issues and problems. Additional papers are being written in various areas and will be available before the work sessions.

leave this population for various reasons. Some individuals depart the American society either through death or emigration, others may be rehabilitated with or without public social assistance. At some time in the future others may leave due to a restriction in the definitions of disabilities.

Society's success in its rehabilitation efforts in reducing the size of the disabled population is related to society's capabilities and willingness to provide solutions to identified problems. Success also depends on the capability and willingness of the members of the disabled population to cooperate in these efforts. Thus, even though society may have the necessary capabilities and willingness to provide solutions to these problems through rehabilitation techniques, success is not automatic.

Despite any rules or regulations prohibiting various forms of discriminatory practices, difficulties do arise in integrating the rehabilitated. Individual attitudes are very difficult to change. [*whose?*] Factors such as the disabled individual's age, sex, race, education and economic levels and the visibility of disability [*and societal acceptance or rejection?*] all play very important roles [see the Life Function report] in solving the problem even when the physical capabilities to provide a solution are present. These factors influence whether or not the rehabilitated individual will be able to function in the environment. Other factors may adversely influence the disabled individual and hinder rehabilitation. For example, the loss of attention previously received from family, friends, etc., the loss of current economic benefits, i.e., income supplement or income maintenance.

Addressing the problem of the currently defined disabled population poses many subproblems. If both society and the disabled population were to achieve "tremendous" success in reducing the size of the disabled population through assorted combinations of human rehabilitation techniques, various impacts may be felt. For example, these consequences could be in the areas of employment and unemployment in general and specifically within the rehabilitation field.

Success in reducing the size of the currently defined disabled population may allow an expansion* of the definition of the disabled in keeping with society's capability and willingness to address additional disabilities in relationship to society's other problems.

*[*or may reduce, since its a zero sum game of total public resources.*]

The Past - A Prologue to the Future

The American social system has a history relating to problem solving activities. From its inception, its economic resources, including not only money and material but also human resources, have continued to grow. The increase in growth is generally believed to have been brought about by the continual change in the objectives and goals established by society and improvements in the method and means used in solving problems. On many occasions resources had to be developed, modified or designed before the means to solve a particular problem became available. For example, education has assisted in developing human resources, new technologies had to be designed for man to reach the moon.

The economic strength of society has, on occasion, been measured through indicators dealing with the society's gross national product (GNP). With an occasional exception, the American society's GNP has continued to grow both in absolute terms and in relationship to the total population. The GNP has also continued to grow relative to the human resources whose production is reflected in GNP. [*there is more precise economic data available*] Thus, it may be possible to consider that the productivity of society has increased not only due to technological development in materials resources, i.e., machines, electronics, etc. but also due to the development of the human resources.

Although the size of the GNP has been used as a reflection of society's standard of living, other factors must be considered when reference is made to that group of problems dealing with the concept of the quality of life or the social well being of society. Efforts to develop more effective methods and means of solving this group of problems began to gain momentum after the turn of the century.

As the American society entered the Twentieth Century, attempts were being made to solve many of its problems. The amount of authority exercised by the public sector within the economic subsystem was comparatively limited. One of these problems dealt with status of the "less fortunate" members of society. Activities of organized labor that began prior to World War I had identified the problem of retraining those workers who had been injured in industrial accidents. By the time the legislation was enacted in 1921 the problem had been enlarged to include other than those injured within industry.

[*By what process was the legislation enacted?*]

This act was termed the Vocational Rehabilitation Act. [For more detailed discussion of the legal environment of rehabilitation see the abstract paper on the legal aspects in Volume V.] Thus, a shift in attitude had taken place*; whereas previously, problems associated with disabilities had been handled almost exclusively within the private sector, they were now addressed in the public sector.

*[*Where? Whose attitude changed? Why the change?*]

During the depression years that followed the crash of 1929, the Social Security Act was passed. This act, passed in 1935, generally addressed the problems of unemployment and old age. Survivor insurance was added to the Social Security Act in 1939. The Railroad Retirement Act of 1937 was established to provide disability and old age benefits to railroad workers. Thus, society gradually increased its willingness to provide economic resources in an attempt to reduce or eliminate problems in those areas. [*Which ones?*] Yet many segments of society still faced severe problems.

World War II brought about a period of rapid growth in the GNP. A common cause [*the war*] provided the impetus needed to accelerate the growth in many areas of technology. During the middle of the war (1943), the Vocational Rehabilitation Act was amended to permit the extension of publicly supported rehabilitation service to the mentally retarded (MR) and the mentally ill (MI). This one stroke formally added hundreds of thousands to the rolls of the disabled thus the increase in the size of the disabled population was due to a change in defintion of eligibility. These hundreds of thousands did not just appear on the horizon. [*Non sequitor.*] Until 1943, at least on the federal level, neglect [*This is the wrong word. They were ignored.*] was the former value judgement. Care for, or rehabilitation of, these individuals [*What individuals?*] had been generally dealt with at the state or local level or in the private sector.

Since that time the number of programs dealing with society's problems have continued to increase. The federal, state, and local governments have increased the exercise of their authority within the economic subsystem considerably. For example, during the 25 year period from 1950 to 1975, total government expenditures increased from 21.34 percent of the GNP to 35.03 percent. If capital consumption values were removed from the GNP, thereby leaving what is termed the net national product (NNP), the relative exercise of economic authority during this same period shows that government expenditures have increased from 23.26 percent to 39.00 percent. It may be well to note that the bulk of the monies used by the federal, state and local governments in this exercise of the public's authority within the economic subsystem is derived from the members of society through various forms of taxes. Taxes over the years have continued to increase as evidenced by government's increased contribution to the GNP. It may be possible that at some level of taxation, productive members of the private sector may become dissatisfied with their share of authority within the economic subsystem. History states that taxes [*and representation*] were a major issue in the founding of this nation. Dissatisfaction, of course, may not be aimed at any specific issue, problem, policy or solution.

Other political events dealing with humanitarian problems occurred during the 1960's. Civil rights issues came to the forefront. Various cultural minorities characterized by ethnic background, socioeconomic levels, or sex began articulating their interests within the political, economic and cultural subsystems. For example, these groups identified [*Was this their action?*] the "what should be" of the problems in such a manner that the resultant legislation not only made it illegal to use disciminatory practices in hiring but also stipulated positive employment practices that were to be followed. Specific employers were required to have a certain percentage [*Only goals I thought.*] of their employees come from within these groups. Additionally, regulations required that many of these employees could not be hired into dead-end, low-level positions.

Although the military forces of the country were involved in an unpopular conflict in Vietnam, the federal government launched the "War on Poverty." One subgroup of the target population of this "War on Poverty," the welfare population, became visible and vocal in expressing the opinion that welfare benefits should be increased. Many of the "benefits" described in the "what should be" were considered as rights and were granted.

The tenor of the 60's and early to mid 70's has been one showing concern for equity issues. These issues are referred to here as equity issues in that they dealt with inequalities resulting from past actions. For example, the affirmative actions legislation designed to ensure employment of members of minority groups in various occupations. It was felt that due to past discrimination practices members of the minority groups had received unequal treatment. Some members of society viewed these actions as preferrential treatment for minorities, especially those people adversely affected because they were not members of any minority group.

The economic recession that began in 1973 and extended well into 1975 initiated a shift in eligibility requirements for receiving unemployment benefits. The length of eligibility was eventually extended from 13 weeks to 65 weeks, under some conditions, in order to assist those people adversely affected by the recession.

Regulations dealing with civil rights issues, the "War on Poverty," affirmative actions in the employment field and unemployment benefits are primarily the results of the actions of or concern for "special interest" groups. Unlike some regulations, most of these regulations detail the rights of the individuals with little if any delineation of responsibilities that these rights carry. Some regulations, however, do specify rights and responsibilities. For example, one such regulation states the members of the society have the "right" to earn a living by working or investing in order to receive income, the IRS rules and regulations deal with the responsibilities to pay taxes on this income.

[*This is so much baloney. What's the point?*]

All in all, it can be said that the American society has continually increased its total capability to address the various problems of society. It would appear logical to state that historically society is willing to address its problems.

[*This assertion and much of the preceeding material in this section lacks the cogency of previous sections. Perhaps an effort to cite supporting references would help.*]

Throughout its history, society has chosen to either measurably reduce or to eliminate many problems. Of course, others have been considered infeasible for solution and still others may appear to some as having been ignored. The solution of the specific problems selected required coordinated joint activity in the use of many resources. The success of the solution was dependent upon the extent of the compatibility of societies capability and willingness to solve the specific problem. For example, the present state of space technology has resulted from past decisions to develop this technology wherein the decisions were based on some value judgements either "commonly held or individually held." Sufficient empirical evidence exists to demonstrate that the current level of technological development within a specific area is reflective of past compatibility of society's capability and willingness to pursue a specific technological problem, e.g., the moon landing.

The review* of the past as presented here highlights the various shifts in attitudes toward human problems dealing with the disabled population and other less fortunate groups.

[*Review does not include the "demand factor" or organizational efforts of the disabled and supportive agencies and individuals. The whole section is too naive.*]

Detailed discussion of various aspects of problems related to the disabled population is presented in the supplemental reports. Concepts of rights and equity, relating to the quality of life or social well being, have been discussed within the context of society's general capability and willingness to provide the methods and means of solving its problems.

Development of Scenarios

Introduction

Scenarios provide useful vehicles for the impact- or consequence-analysis step of technology assessment. They provide an outline of some conceivable future state(s) of affairs given certain assumptions about the present and a consideration of the occurrences leading to the future period. Scenarios are descriptions of future developments. Scenarios should develop alternative possible futures, describing the range of developments, those which are likely to occur, those which are reasonably expected, and even those which are conceivable or plausible as well as these which are desirable. They are developed in order to illsutrate the future, to stimulate thought about the future, and to provide a background against which an understanding of the impacts and consequences of special issues or program thrusts can be determined. Usually TA studies use scenarios to represent "high," "average," and "low" situations. These are usually expressed by a limited number of scenario theme dimensions that are selected to be basic characteristics which are representative of potential futures.

Assumptions Relative to Human Rehabilitation

In order to develop the future states to provide for the assessment of long-range effects from various program thrusts applied to the problem of rehabilitation, general assumptions as presented in Figure 2-3, were made about society and its influence on human rehabilitation in the future.

1. Government-ensured egalitarianism, providing the disabled and other disadvantaged individuals with opportunity for "life, liberty, and the pursuit of happiness" approximately equal to that of nondisadvantaged individuals, will continue.

2. Government legislation in, funding for, and administration of social-welfare programs will continue to increase.

3. Refinement and sophistication of social-welfare programs, along with a greater proportion of governmental resources being devoted to social needs, will elicit an increasing demand for greater accountability by program administrators and participants.

4. Increased resources devoted to social-welfare programs must be obtained from either increased productivity or reallocation of public or private resources currently devoted to other types of programs.

5. Governmental expenditures will continue to be funded primarily through taxation.

6. The present goal of rehabilitation--to improve the social well being of the disabled by integrating them into society and, if possible, into the workforce--will continue, at least for the immediate future.

7. As technology develops, there will be improvement in rehabilitation techniques.

Figure 2-3. Assumptions relative to human rehabilitation

Basic Scenario Themes and Dimensions

Based upon past trends, present consideration and emerging policies; three broad potential futures emerge within which the problem of human rehabilitation can be assessed. These are as follows:

Scenario Group I

MEDIAL: Moderate Growth in Funding for Social Needs, No Limit on Willingness to be Taxed.

MEDIAL-C: Moderate Growth in Funding for Social Needs, Constraints on Willingness to be Taxed.

Scenario Group II

UPPER: Accelerated Growth in Funding for Social Needs, No Limit on Willingness to be Taxed.

UPPER-C: Accelerated Growth in Funding for Social Needs, Constraints on Willingness to be Taxed.

Scenario Group III

LOWER: Reduced Growth in Funding for Social Needs, No Limit on Willingness to be Taxed.

LOWER-C: Reduced Growth in Funding for Social Needs, Constraints on Willingness to be Taxed.

These three represent an envelope of possible alternatives from minimal to rapid growth as well as redistribution of funds among programs and a host of other conditions which are discussed later.

The capability of society to address any of its needs or problems is a function of multiple factors, the main contributors being the availability of financial, technological, organizational, and the related resources. Based on a consideration of the problem at hand and society's operation in the past, it was assumed that society's capability may be represented and measured best by the financial and technological factors. Society has been able to develop proper organizational structures and provide the necessary resources when the finances and technologies were available.

A general measure of society's financial capability to address the problems of the disabled is defined as per capita net national product (NNP = GNP - Capital Consumption) obtained by dividing the NNP by the size of the population (NNP/Pop.). The financial capabilities alone cannot directly produce rehabilitation. Thus, society's technological capabilities are also important.

A measure for society's overall technological capability could be employed; e.g., in terms of the difference over time in the NNP contribution per individual in the employed workforce; i.e., [NNP_{T_n}/Size Employed $Workforce_{T_n}$ - $NNP_{T_{n-1}}$/Size Employed $Workforce_{T_{n-1}}$], where T_n is the latest period being considered and T_{n-1} is a prior period and assuming productive hours remain constant. The difference (increase) in each worker's contribution to NNP may be viewed as the contribution

Society's decision to continue addressing social problems and especially those of the disabled population will be predicated on both its capability and willingness to do so. These two major characteristics were selected, in that for any problem involving humans the mere existence of the capability to act a certain way under a given set of circumstances does not in and of itself state that humans will act that way. Thus, although society may possess the capabilities to provide the means, it may not be willing to provide the means. Conversely, even if society were eager to provide the means, it could not do so without the capabilities. A general conceptual hierarchy of these basic variables and rehabilitation program thrusts is depicted in Figure 2-4.

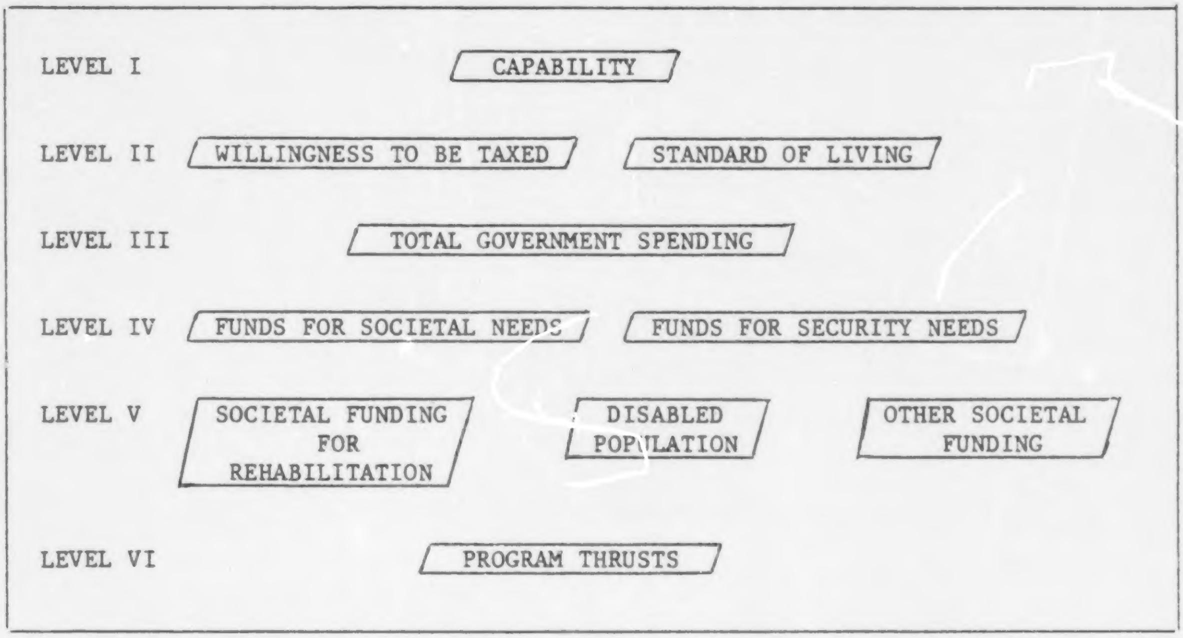
LEVEL I
CAPABILITY
LEVEL II
WILLINGNESS TO BE TAXED
STANDARD OF LIVING
LEVEL III
TOTAL GOVERNMENT SPENDING
LEVEL IV
FUNDS FOR SOCIETAL NEEDS
FUNDS FOR SECURITY NEEDS
LEVEL V
SOCIETAL FUNDING FOR REHABILITATION
DISABLED POPULATION
OTHER SOCIETAL FUNDING
LEVEL VI
PROGRAM THRUSTS

Figure 2-4. Hierarchical arrangement of elements appearing in scenarios.

of increased technology available to society. This measure, however, considers technological contributions and advances in all areas of need or endeavor and what is required to consider the problem under study--human rehabilitation techniques--is a measure of the technological capability in addressing only this problem. Therefore, when the cumulative effects of applying technological advances in rehabilitation are felt, the rate of rehabilitation will increase, the rate of growth of the disabled population will decline. Thus, society's technological capability in addressing the human rehabilitation problem will be reflected in the relative size of "disabled population," as other factors remain constant in this study. [*What does this mean?*]

The general willingness of society to address any of its problems is also a function of multiple factors, such as: the expenditure of funds from private individuals and foundations; public funds for programs at federal, state and local levels; attitudinal positions; [*demands of disabled*] etc. Based on the problem under consideration, it was assumed that society's willingness to be taxed in order to provide public funding for public programs is representative of this dimension. Therefore, the general measure of society's willingness to address public problems is defined in terms of the total public funds applied to security needs, social needs and other needs relative to the net national product.[2] That is:

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[2] The classification is based on items contained in The United States Budget in Brief--Fiscal Year 1977, Executive Office of the President of the United States, Office of Management and Budget, Washington, D.C. (January, 1976).

$$\text{Willingness} = \frac{\text{Government Spending for} \atop \sum(\text{Security needs}) + \sum(\text{Social needs}) + \text{Other needs}}{\text{NNP}}$$

Security Needs	Social Needs	Other Needs
i.e., national defense, international affairs, science and technology, natural resources and environment, agriculture, commerce and transportation, law enforcement and justice.	i.e., education and social security, health, income security, veterans benefits, revenue sharing, community and regional development.	i.e., general government, interest.

This measure also permits the consideration of the rehabilitation problem within the total needs of society. Based on some of the reports presently appearing relative to taxation in Sweden and Great Britain, for example, this measure appears to have an upper limit.

Within this general structure of society as defined by the measures of capability and willingness, the problem of rehabilitation of the disabled is embedded as one of the social needs requiring and receiving consideration and support.

The problem of human rehabilitation is a function of multiple factors, for example size of the disabled population, funds and other resources required, visibility, political power [*demands of the disabled population*] etc. The significance of a problem and/or the subpopulation affected varies considerably and is usually related to its visibility [*and demands*]. It is not the intention here to determine the significance, visibility, etc., but rather to accept that human rehabilitation is considered necessary in order to reduce the problems of disability as indicated by the extent of attention given by legislation enacted, by funding provided both by private and governmental agencies, etc. Thus, the problem must be defined. The general scope of this problem is best defined by the size of the problem both from the aspect of financial support devoted to it and by the number of individuals included in the disabled population. The disabled population is defined here as including those who, due to some physical or mental impairment either are limited in their ability to perform certain types or amounts of human functions or do not have the ability to perform at least a minimum of normal human functions. The measures selected to represent the general problem are therefore the size of the disabled population, and the funds made available to rehabilitation expressed as the funds allocated to rehabilitation relative to the funding for all social needs.

These four basic variables---(1) capability, (2) willingness, (3) funds for social needs, and (4) disabled population---reflect the general dimensions of the state of society within which the problem is being assessed and provide the themes for the scenarios utilized in the TA. With these scenarios generally structured within the hierarchial model described in Figure 2-4, it was possible to perform the consequence analysis of various program thrusts that may be considered for adoption in rehabilitation. The scenarios are basically defined in terms of funds available for social needs and are descriptive of many potential futures. For example, should a major war involve our society, funds for security needs would undoubtly increase thus having a possible decreasing affect on funds for social needs. Likewise, if a major famine should involve our society or if society should decide on a major accelerated program to develop the energy technologies and defense needs remained constant, funds for security needs would probably increase while general social need funding and funds for rehabilitation may decrease, may remain the same or in some cases may even increase. Even though willingness to be taxed under these conditions would most likely increase, there may be reduced growth in funding for social needs [*Why would this be so?*] as represented by Scenario Group III, LOWER and LOWER-C. Likewise, should a major breakthrough in technology, as applied to the disabled, take place in the future, this would have the same effect as that of an increase in capability. This along with no increase in security needs [*necessarily?*], could provide an accelerated growth in funding for social needs. A future of this type may be represented by Scenario Group II, UPPER and UPPER-C.

> *To have a large scale impact, this "major breakthrough" would have to occur in the common disability areas of MR and schizophrenia. Considering progress in the last 100 years in neurology and psychology, how probable is it that the next 50 years will produce ways to correct these genetic errors? My reading of this history forces me to assign a very low probability.*

The capability of society within each of three scenario groups, MEDIAL, UPPER, and LOWER, along with its components are depected in Figures 2-5 through 2-7. The middle growth rates of both the NNP and the general population were used in plotting society's capability within the MEDIAL scenario group. Whereas

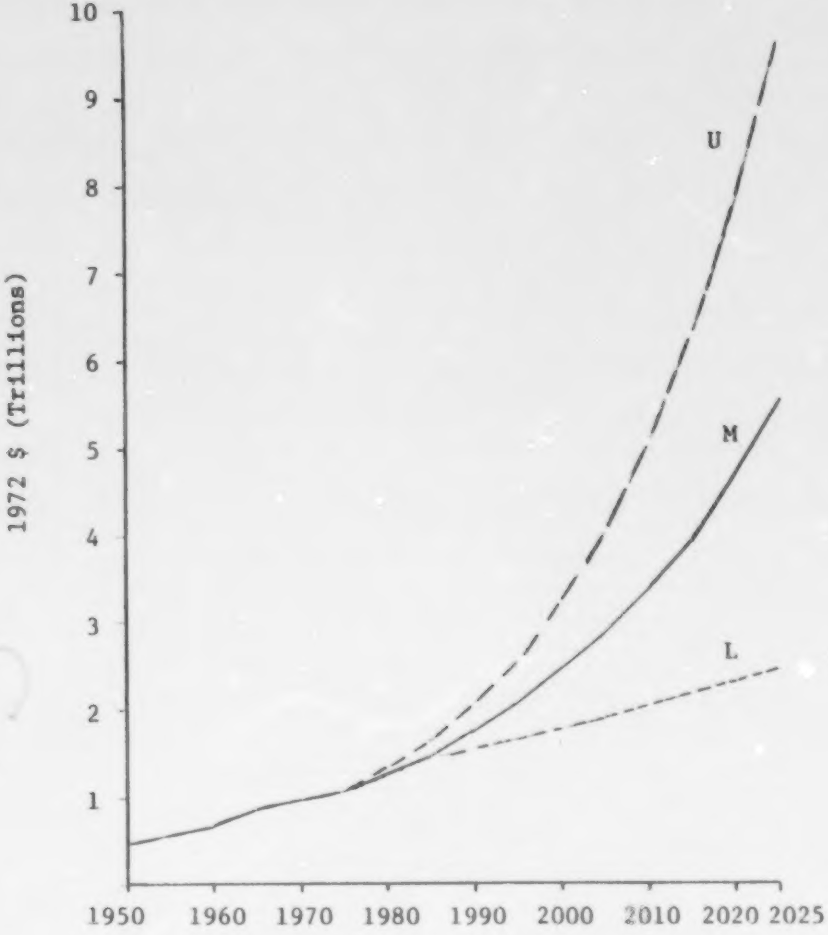

Figure 2-5. Historical and projected NNP's in 1972 dollars, 1950-2025.

Note: Growth rates based on predictions made for GNP in "Energy, the Economy and Mass Transit," United States Congress, Office of Technology Assessment, 1975, and "Technology Assessment of Portable Energy RDT & P," Center for Energy Studies, The University of Texas at Austin, 1975. The low growth rate was a lower boundary.

Projections of NNP in 1972 Dollars (Billion)

	M	U	L
	Constant 3.35% to 2025	Constant 4.5% to 2025	3.14% to 1985 1.33% to 2025
1975	1,068.6	1,068,6	1,068.6
1980	1,259.9	1,331.7	1,247.2
1985	1,485.6	1,659.5	1,455.7
1990	1,751.8	2,068.0	1,555.1
1995	2,065.5	2,577.2	1,661.3
2000	2,435.4	3,211.6	1,774.8
2005	2,871.6	4,002.2	1,896.0
2010	3,386.0	4,987.5	2,025.5
2015	3,992.4	6,215.4	2,163.8
2020	4,707.6	7,745.5	2,311.6
2025	5,550.6	9,652.8	2,469.4

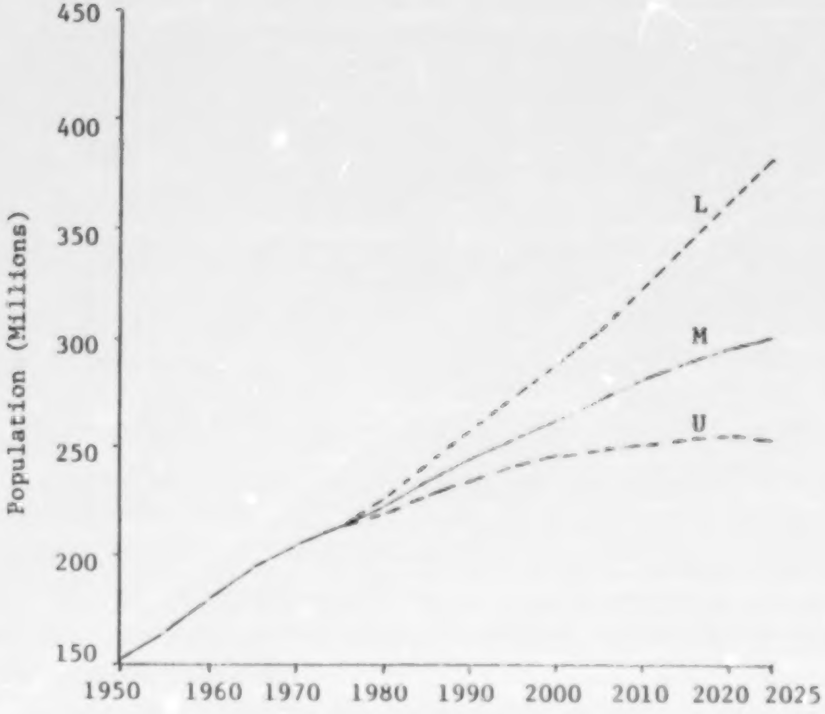

Figure 2-6. Historical and projection of total population, 1950-2025.

Note: Growth rates based on predictions made for GNP in "Energy, the Economy and Mass Transit," United States Congress, Office of Technology Assessment, 1975, and "Technology Assessment of Portable Energy RDT & P," Center for Energy Studies, The University of Texas at Austin, 1975. The low growth was arbitrarily selected in order to establish a lower boundary.

Projections of Population Various Average Growth Rates (Millions)

Year	M .68%	U .33%	L 1.17%
1975	213.6	213.6	213.6
1980	222.8	220.4	225.7
1985	234.1	228.4	241.3
1990	245.6	235.6	257.7
1995	253.6	241.6	272.0
2000	262.5	245.1	287.0
2005	271.0	248.0	302.0
2010	280.0	251.0	322.0
2015	288.0	253.0	342.0
2020	295.0	255.0	362.0
2025	300.0	252.0	382.0

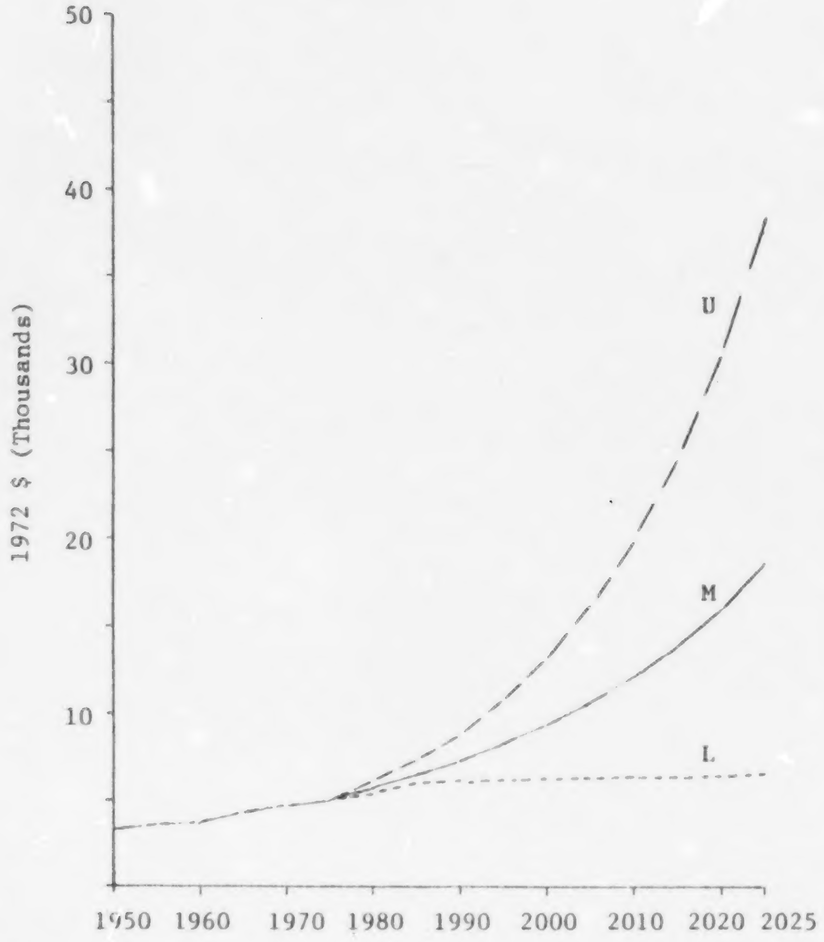

Figure 2-7. Historic and projection of NNP('72$)/population, 1950-2025 (capability)

Note: Growth rates based on predictions made for GNP in "Energy, the Economy and Mass Transit," United States Congress, Office of Technology Assessment, 1975, and "Technology Assessment of Portable Energy RDT & P," Center for Energy Studies, the University of Texas at at Austin, 1975. The low growth rate was arbitrarily selected in order to establish a lower boundary.

Projections of NNP/Projections of Pop
(Constant 1972 Dollars)

Year	M/M	U/U	L/L
1975	5,002	5,002	5,002
1980	5,655	6,042	5,526
1985	6,346	7,266	6,033
1990	7,133	8,778	6,035
1995	8,145	16,667	6,108
2000	9,278	13,103	6,184
2005	10,596	16,138	6,278
2010	12,093	19,871	6,290
2015	13,863	24,567	6,327
2020	15,958	30,375	6,386
2025	18,502	38,305	6,464

society's capability within the UPPER scenario group was calculated by using the high growth rate of NNP coupled with the low growth rate projected for the population. The reverse process was used in calculating society's capability within the LOWER scenario group. That is, the low growth rate of NNP was coupled with the high growth rate projected for the population. If one were to assume the high and low growth rates for both the NNP and population were within reason, any combination of these two variables would produce a plot of society's capability that would fall somewhere between the capabilities shown in the UPPER and LOWER scenario groups.

The measurements of society's willingness to address public problem are expressed in terms of the percentage of NNP attributed to total government spending. Figure 2-8 presents the historical growth in total government spending along with projections based on possible future growth rates in total government spending. Figure 2-9 depicts the historical growth in the percentage of NNP attributed to total government spending. Additionally, projections of these relationships are shown using both the 5.6 and 1.3 percent per year increases in government spending relative to the MEDIAL, UPPER, and LOWER growth rates in the NNP as given in Figure 2-5. With an annual growth rate of 5.6 percent per year, government spending would comprise 102.80 percent of the MEDIAL NNP by the year 2020, 112.72 percent of the LOWER NNP by the year 2005. Both of these conditions would eliminate any

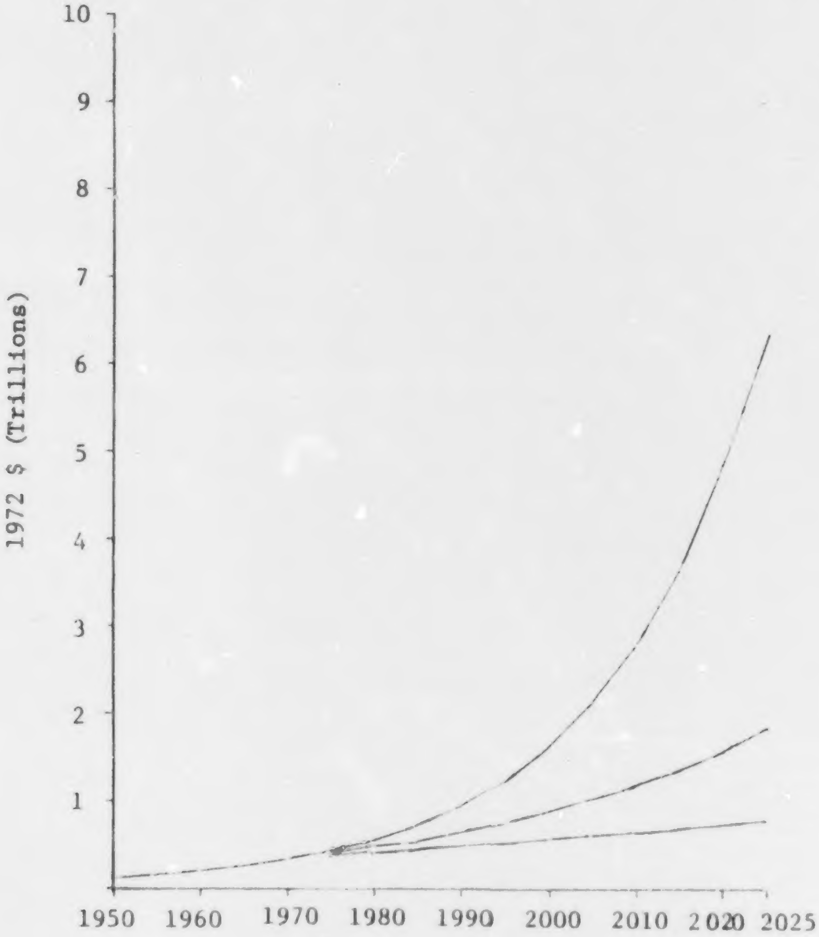

Figure 2-8. Historical and projected total government spending 1950-2025

Year	Projections of Government Spending at Average Annual Rate of: (Constant 1972 Dollars)		
	5.6%	3.0%	1.3%
1975	416.8	416.8	416.8
1980	547.3	483.2	444.6
1985	718.7	560.1	474.3
1990	943.8	649.4	505.9
1995	1,239.8	752.8	539.7
2000	1,627.5	872.7	575.7
2005	2,137.2	1,011.7	614.1
2010	2,806.5	1,172.8	655.0
2015	3,685.3	1,359.6	698.7
2020	4,839.5	1,576.2	745.3
2025	6,355.0	1,827.1	795.1

Note: From 1950-75 Government spending increased an average of 5.33 percent per year.

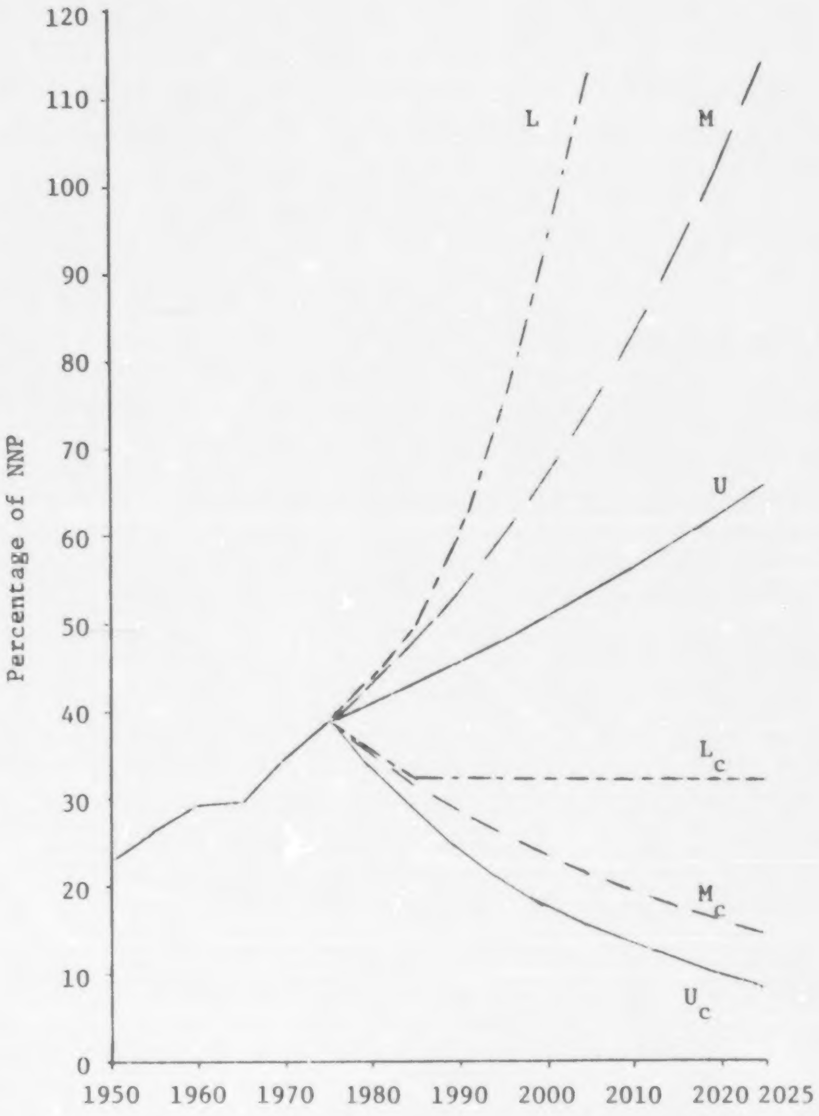

Figure 2-9. Historical and projected total government spendings/net national product(s) 1950-2025

Projected Government Spending as Percent of NNP Projected in Figure 2-5 with Government Spending Increasing at Average Ratio of:

		5.6%			1.3%	
Year	M NNP	U NNP	L NNP	M NNP	U NNP	L NNP
1975	39.00	39.00	39.00	39.00	39.00	39.00
1980	43.44	41.10	43.88	35.29	33.39	35.65
1985	48.38	43.40	49.37	31.93	28.58	32.58
1990	53.88	45.64	60.69	28.88	24.49	32.53
1995	60.02	48.11	74.63	26.13	20.94	32.48
2000	66.83	50.68	91.70	23.64	17.93	32.43
2005	74.43	53.40	112.72	21.39	15.34	32.39
2010	82.89	56.27	138.56	19.34	13.13	32.34
2015	92.31	59.29	173.32	17.50	11.29	32.24
2020	102.80	62.48	209.36	15.83	9.62	32.24
2025	114.49	65.84	257.35	14.32	8.24	32.20

Note: From 1950-75 total government spending as a percent of net national product increased an average of 2.08 percent per year.

any nongovernment expenditures within the NNP. Even when using the projection for the UPPER NNP, if government spending increases at 5.6 percent year, 65.84 percent of the NNP would be attributed to government spending by the year 2025.

Although it is not shown in Figure 2.8, the relationship of government spending to NNP wherein government spending is increasing at 3.0 percent per year, the percent of NNP attributed to government spending under the MEDIAL scenario decreases from the current 39.00 percent in 1975 to 32.92 percent in 2025, under the UPPER scenario this percentage decreases from the current 39.00 percent to 18.93 percent in 2025. Within the LOWER scenario the percentage of government spending of NNP increases to 73.99 percent. (See Related Data Project Paper in this Volumn.)

As shown in the data portion of Figure 2-9 the percentage of NNP attributed to government spending decreases under all scenario NNPs if the rate of growth in government spending is reduced to 1.3 percent per year. Yet even at this 1.3 percent per year total government spending would increase in constant 1972 dollars some 190.7 percent from 1975 to the year 2025.

Total government spending as a percent of NNP was used as the measure of society's willingness to address public needs in general. These needs were subdivided into social, security and other needs. Figure 2-10 depicts the historical growth of government spending for social needs. As previously shown total government spending increased an average of 5.33 percent per year from 1950-1975. From 1970-1975 total government spending

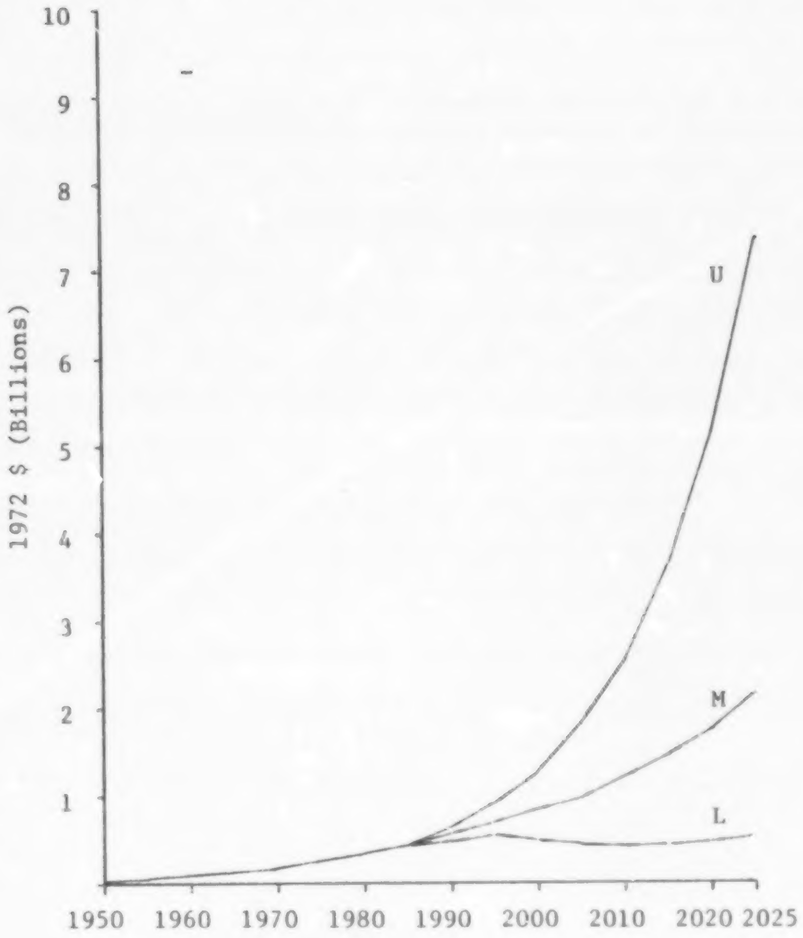

Figure 2-10. Historical and projections of total government spending for social needs

Projections of Government Spending for Social Needs At Annual Rates of: (Constant 1972 Dollars)

Year	U Constant Rate of 7.2% to Yr 2025	M Constant Rate of 7.2% to Yr 1985 4.0% to Yr 2025	L Variable Rate of 7.2% to Yr 1985 1.3% to Yr 1995 -.9% to Yr 2010 +.9% to Yr 2025
1975	227.4	227.4	227.4
1980	321.9	321.9	321.9
1985	455.8	455.8	455.8
1990	645.2	554.5	486.2
1995	913.5	674.6	518.6
2000	1,293.2	820.8	495.7
2005	1,830.8	998.6	473.8
2010	2,591.8	1,215.0	452.8
2015	3,669.3	1,478.2	473.6
2020	5,194.6	1,798.5	495.3
2025	7,354.1	2,188.1	518.0

increased an average of 4.08 percent per year. Government spending for social needs increased an average of 6.8 percent per year from 1950-1975. From 1970-1975 government spending for social needs increased an average of 7.36 percent per year. This amount was down by 1.59 percent per year from the preceeding five year period from 1965-1970. An increase of slightly over the average annual growth rate over the 25-year time span was used to represent the high growth rate of government spending for social needs. At this rate, government spending for social needs would exceed the total projected NNP under the LOWER scenario by the year 20[illegible]0 and the projected NNP under the MEDIAL scenario by the year 2020.

Thus, the projections of 7.2 percent per year was used within the UPPER scenario only, the projection of 7.2 percent to the year 1985 then decreasing to 4.0 percent thereafter used in the MEDIAL scenario, while the remaining projection containing both positive and negative growth rates of government spending was used in the LOWER scenario. Even this latter projection shows a total increase in government spending for social needs of some 227.8 percent in constant 1972 dollars by the year 2025 over the 1975 level of spending.

The historical and projected ranges in the size of the disabled population are shown in Figure 2-11. The historical size of the disabled population is given as a range to represent the various estimates as to its size, found within the literature. A rough midpoint of these estimates was used as the initial

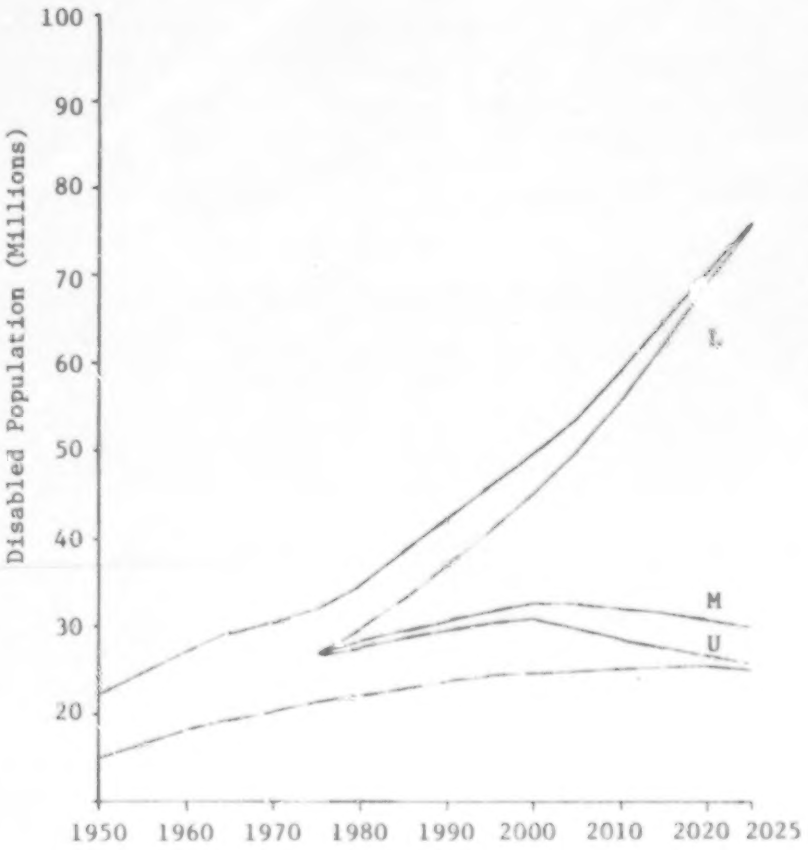

Figure 2-11. Historical and projections range in size of the disabled population, 1950-2025.

	Estimated Boundaries		Disabled Population in Scenarios*					
	Lower 10%	Upper 15%-20%	Medial		Upper		Lower	
Year	Pop U	Pop L	% Pop**	#	% Pop***	#	% Pop****	#
1975	21.4	32.0	12.5	26.7	12.5	26.7	12.5	26.7
1980	22.0	34.8	12.5	28.5	12.5	27.6	13.1	29.6
1985	22.8	38.3	12.5	29.3	12.5	28.6	13.7	33.1
1990	23.6	42.1	12.5	30.7	12.5	29.5	14.4	37.1
1995	24.2	45.8	12.5	31.7	12.5	30.2	15.1	41.0
2000	24.5	49.7	12.5	32.8	12.5	30.6	15.8	45.4
2005	24.8	53.8	11.9	32.4	- .7	29.5	16.5	50.1
2010	25.1	59.1	11.4	32.0	- .7	28.5	17.4	55.9
2015	25.3	64.6	10.9	31.5	- .7	27.5	18.2	62.3
2020	25.5	70.3	10.5	30.8	- .7	26.6	19.1	69.1
2025	25.2	76.4	10.0	30.0	- .7	25.7	20.0	76.4

*Starting point in 1975 assumed 12.5% of total population as midpoint of the boundaries.

**The disabled population as a percentage of total population remains constant to year 2000 then the disabled population reduces to 10% of the total population in 2025.

***The disabled population as a percentage of total population remains constant to year 2000 then the disabled population reduces at an annual rate of .7%.

****The disabled population gradually increases to 20% of the total population by year 2025.

starting point in projecting the future size of this population.

The MEDIAL scenario reflecting moderate growth in funding for social needs with no limit on the willingness to be taxed is discussed first.

Scenario Group I

MEDIAL: Moderate Growth in Funding for Social Needs, (No Limit on the Willingness to be Taxed).

No major new funding for rehabilitation occurs though moderate growth is experienced, the maintenance of programs initiated in the 70's continues, and some minor reallocations among programs are made.

The disabled population grows at a moderate rate maintaining approximately the same percentage of total population to about the year 2000. At this time, due to continuing research programs of the 60's and 70's, [*I can find no single example of such research program.*] technological development in rehabilitation techniques begins to have marked effect and the growth rate of the disabled population declines thus the relative size of the disabled population begins to decrease.

At least one scenario should posit a disabled population growing at a greater rate than the general population.

I. *Many technologies produce more disability than they correct (auto crashes, underground mining, chemical, professional sports, etc.).*

II. *Urban life stresses (1) trigger inherent predispositions to schizophrenia, alcoholism and other joint heredity/environment diseases; (2) produce levels of social complexity that borderline persons cannot handle, causing them to be unable to function and thus be labelled as MRs; and (3) include greater demands for educational attainment, subsequent failure and disabling maladjustment.*

III. *The predominant and growing social philosophy that MRs and schizophrenics should not be discouraged from reproducing will have a (very small) effect of increasing their percentage representation over each generation.*

IV. *Medical/surgical advances keep many more people alive (but partially to totally disabled) and this technology appears to be growing much faster than are rehabilitative techniques.*

V. *Increased population density may, by itself, trigger increased numbers of disabled.*

This may be due, in part, to increased technological development in related areas, thus by the year 2000, the mildly and moderately disabled are more readily integrated into society. For example, new transportation systems are capable of accommodating the disabled [*not likely under this scenario*]; public buildings are designed or remodeled so that they are now accessible to the disabled; industry has positive programs for their employment, etc.

Society maintains the current annual growth rate of 2.3 percent in its productivity and the NNP grows at an average annual rate of 3.35 percent. [Prediction from Energy, the Economy and Mass Transit, United States Congress, Office of Technology Assessment, 1975]. The rate of population growth continues its decline and levels at an annual rate of .685 percent. [Predictions based on Statistical Abstract of the United States, 1975]. Society's unemployment rate continues at approximately the 6-7 percent level and there are no major changes in current work schedules, the work week remains much as it is today. The telecommunications industry contributes technology that permits some work to be performed in the home. Although this makes more jobs available to the disabled population, the disabled find that they are now competing for this type of work with the nondisabled unemployed.

The capability and the willingness of society to address its public needs grows moderately along with the economy.

Due to legislation of Congress in the 60's and 70's, a sizable amount of future governmental spending is committed to the natural growth of existing programs. Thus, the rate of growth in government spending established in the 60's and 70's extends to the year 2000. This has the effect of lowering the amount of private discretionary spending for large segments of society.

The problem of energy continues through the year 2025, thus any energy intensive program thrusts are not highly favored.

MEDIAL-C: Moderate Growth in Funding for Social Needs, Constraints on Willingness to be Taxed.

Under this scenario, all factors are as depicted above except that as the tax rate rises beyond a certain point [*At what level?*] society reacts by opposing any new or additional funds for governmental programs. This has an affect on public funds available for rehabilitation.

Scenario Group II

UPPER: Accelerated Growth in Funding for Social Needs No Limit on Willingness to be Taxed.

With an increasing rate of growth in the economy, funding for social programs grows and this has the effect of increasing funds available for rehabilitation.

The disabled population grows at a moderate rate maintaining approximately the same percentage of total population to about the year 2000. At this time, due to new public funding for rehabilitation programs brought about by the increase in taxable incomes of a more affluent society during the 80's and 90's. Along with some major reallocations among existing programs, the government is able to not only maintain the funding trends of the 70's but to introduce new rehabilitation programs. These, along with the technological development of new techniques in both the rehabilitation field and in related areas, begin to have marked effects on the size of disabled population as currently defined. The absolute size of the population stabilizes and subsequently begins to decline at about .7 percent per year. Additionally, this brings about a decrease in the relative size of the disabled population.

[*Both? If funding and willingness to be taxed unlimited, won't these be an expansion in definition of disabled, thus a larger population?*]

Due to increased technological development in related areas, by the year 1995 the mildly and moderately disabled are more readily integrated into society. For example, new transportation systems are capable of handling the disabled; public buildings are designed or remodeled to be accessible to the disabled; and industry has positive programs for employment of the disabled, etc.

Society improves its annual growth rate in its productivity to 3 percent and the NNP grows at an average annual rate of 4.5 percent from now to 2025. [Predictions based on Technology Assessment of Portable Energy, RDT & P Center for Energy Studies, The University of Texas at Austin]. The rate of growth of the population decreases slightly from the current annual rate and stabilizes at .630 percent until 1985. From 1985 to 2020 the annual growth rate of the population is again reduced, this time to .3654 percent. From 2020 to 2025 the size of the total population declines by an annual rate of .236 percent. [Predictions as to the size of the total population are based on Statistical Abstract of the United States, 1975].

Unemployment rates decrease to approximately the 4-5 percent level. For this reason and the relative prosperity of society and their desire for leisure time in larger amounts than that provided by the two day weekend, experimentation with different work scheduling procedures occurs. By the turn of the century, people are permitted to "bid" on work time and with the use of computers, individualized worker schedules are a reality. [*Leisure time, "bid"? interesting!*] The basic 1920 working hours per year is maintained in certain areas, however, in many areas the working hours per year is reduced to approximately 1500 hours.

The telecommunications industry contributes technology that permits considerable work to be performed in the home. [*Interesting emphasis.*] This makes more jobs available to the disabled population and many are gainfully employed because of the general prosperity and the increasing productivity taking place.

The capability and the willingness of society to address its public needs increased along with the economy.

Although the legislation passed by Congress in the 60's and 70's, committed a sizable amount of future governmental spending to the natural growth of existing programs, efforts to provide funds for the retirement of the public debt required that the tax rate be increased slightly. The general standard of living improved for each major segment of society.

Due to increased research in developing sources of energy, the energy problem begins to subside around the turn of the century. Thus, more energy intensive rehabilitation technologies become feasible.

UPPER-C: Accelerated Growth in Funding for Social Needs, Constrained on Willingness to be Taxed.

Under this scenario all factors remain as described above except that as the tax rate raise beyond a certain point, society reacted by opposing any new or additional funds for governmental programs. Because of the prosperity and the increasing standard of living, this threshold limit is somewhat higher than under Scenario Group I. Also, due to the prosperity, national debt has been decreased and governmental interest is reduced, thus permitting more funds for other programs. This has a beneficial affect on funds for rehabilitation.

Scenario Group III

LOWER: Reduced Growth in Funding for Social Needs, No Limit on Willingness to be Taxed.

[*Couldn't this occur in the face of a rising economy.*]

As the growth rate of the economy declines coupled with an increase in the growth of the population, a decline in society's capability to address public problems is experienced. This may have an adverse affect on their willingness, and funds for social programs. This in turn has an affect on funds available for rehabilitation, in fact, some programs initiated in the 60's and 70's may experience curtailment.

Due to curtailment of some programs and the reduction of research programs of the late 70's and 80's, technology development for rehabilitation is lagging and the growth rate of disabled population increases, thus the disabled population grows both in absolute and relative size.

[*The rate of growth would increase*]

Technological development in related areas is slowed, thus affecting the rate at which the mildly and moderately disabled may be integrated into society.

Due to legislation of Congress in the 60's and 70's, a sizable amount of future governmental spending is committed for the natural growth of existing programs. Thus, the growth rate of government spending rises at an accelerated rate and this coupled with only a continuation or reduction in the current growth rate of productivity has the effect of lowering the general material standard of living or "lifestyle." Government funded programs are all subjected to review.

The society experiences reducing rate of growth in the NNP until 1985 at which time the growth rate of the NNP stabilizes at an annual rate of only an estimated 1.33 percent. The growth rate of the population is higher due to reduction in emphasis on population control and grows at an average annual rate of 1.175 percent. [Prediction based on Statistical Abstract of the United States, 1975].

Unemployment rates rise to approximately the 9-11 percent level. Thus, social needs for the unemployed increase. All of these factors have considerable affects on the disabled population. Their integration into society may be hampered due to the lack of funds and their employment opportunities are limited due to the competition for work from the unemployed non-disabled.

LOWER-C: Reduced Growth in Funding for Social Needs, Constrained on Willingness to be Taxed.

Under this scenario, all factors remain as described above except that as government spending rose above a certain point society reacted by opposing any new or additional funds for governmental programs specifically designed to assist minority groups. Because of the reduced material standard of living, this threshold limit is somewhat lower than under Scenario Group I.

Data Base

To accompany these scenarios considerable data concerning an assessment of variables was provided. Foremost among these was the data for the four theme variables (see Figures 2-5 through 2-11) reported from the past to the present and projected into the future. This data, along with data concerning other variables was accumulated and is presented in the project paper entitled Related Data.

SCOPE OF THE PROBLEM OF DISABILITY: LIFE FUNCTION

Introduction

The following report is intended as a resource on the problems of the disabled in the United States. It offers conceptual schemes for analyzing the scope of the problem of disability, and it provides data and analyses on such topics as definitions, prevalence rates, demographics, etiology, life functions or needs, and status in the labor force and community. It is, however, as much about the status of knowledge about the disabled as it is a compendium of knowledge about the disabled. It raises questions about gaps in knowledge and pinpoints several areas in which the base of information underlying rehabilitation efforts might be strengthened.

The bulk of the report focuses on fourteen disability groups selected for intensive analysis. In the technology assessment team's first excursions into the literature, it became apparent that many reports with a broad focus existed but that they often told of numbers of persons affected or served, or of costs of disability, without speaking of the everyday needs of the disabled. The team did not have the resources to launch a major field investigation of the needs of the disabled, although, in retrospect, that might have been a cost-effective route. Instead, it was decided that scholars and practitioners knowledgeable about the disabled could serve as data sources; that their knowledge could be accessed through the published literature; and that if the literature concerning several disparate disabilities were brought together and analyzed in the same way, new insights into problems of disability could be gained. The concept of life functions - health, mobility, communication, cognitive-intellectual functioning, and social-attitudinal functioning - guided the analysis from the start and is a major emphasis in this report.

The present report is a preliminary - and, in many ways, superficial - synthesis of the case study disability reports and related material. Several topics such as incidence rates, mortality, estimated costs of disability, and characteristics of the service delivery system applied to a given disability group are omitted, in part due to time constraints and priorities, and in part due to obstacles in analyzing complex information which is not collected routinely and standardly across disabilities. Information is often presented disability group by disability group rather than collapsed across groups to emphasize the diversity among groups and the dangers of over-generalization. Portions of the case study disability reports have been reviewed by disabled persons. We hope that disabled readers will recognize parts of their experience in this report; otherwise, we have failed.

WHAT IS DISABILITY?

If one thing is clear, it is that there is no clear definition of disability. Different social institutions have established different definitions; definitions are often limited in scope, particularly with respect to their failure to focus on functional limitations associated with diagnostic labels; and conceptual definitions are rarely translated into unambiguous operational definitions.

For quite some time, there has been an attempt to distinguish between conditions and their implications for functioning. Hamilton (1950) distinguished between the terms "disability" and "handicap":

> A disability is a condition of impairment, physical or mental, having an objective aspect that can usually be described by a physician...A handicap is the cumulative result of the obstacles which disability interposes between the individual and his maximum functional level (p. 17).

Although the basic distinction between the condition the person has and the functional difficulties he encounters in daily living has become firmly fixed in the language of rehabilitation, there are problems in Hamilton's definition. He did have the wisdom to say that a disability "can usually" be described objectively, but the disability definition applies most directly to medical or organic conditions and is not as applicable to mental conditions. In the case of mental illness, for example, the term "illness" is a metaphor and, some would argue, a misnomer. Because an organic pathology does not exist and identification of the mentally ill is based on observed symptoms, the distinction between disability and handicap tends to break down.

Another weakness of Hamilton's definition is that it does not go too far toward clarifying the meaning of handicap. How is the degree of handicap to be measured if it is conceptualized in terms of an undefinable concept - "maximum functional level"? Secondly, although the definition addresses the effects of disability on maximum functional level, what about the effects of the environment on functional level and the interactions of the environment with the handicapped person?

In its Comprehensive Service Needs Study, commissioned to provide recommendations related to implementation of the Rehabilitation Act of 1973, the Urban Institute (1975) distinguished among three terms:

> Our preference is to call the residual limitation resulting from congenital defect, disease, or injury an impairment. A person with an impairment, then, may or may not have a disability, an inability to perform some key life functions. When the inability is such that the environment imposes impediments to the individual's goals for travel or work, for example, the individual has a handicap (p. 25).

The Urban Institute report is quick to point out that these terms are not always valuable tools, simply because data have not typically been collected with such distinctions in mind. Operational definitions of disability and handicap have not been standardized, although attempts have been made to develop functional assessments. As the Urban Institute report states, diagnostic labels have been used as "proxies" for disability and handicap - and sadly inadequate proxies at that, given the ranges of severity within virtually all diagnostic or impairment categories and the fact that two people with the same degree of impairment may not be similar at all in their abilities to perform life functions or in the ways in which their environments further interact with their disabilities to constrain adjustment as a member of the community and member of the labor force.

The distinctions among impairment, disability, and handicap are incorporated in the model adopted for use in the present technology assessment. The technology assessment team developed a concept of life functions independently of the Urban Institute which is similar to that used by the Urban Institute. There, the authors speak of disability as "functional limitations in the ability to care for oneself or to perform the key expected social roles - especially with respect to work" (p. 24). Although we often use the term disability to refer to impairment, we distinguish between a condition and the limitations associated with a condition in five life function areas - mobility, health, communication, cognitive-intellectual functioning, and social-attitudinal functioning. The five life functions are presented in Figure 3-1. Any impaired group or person can be described in terms of need statements which describe deficient functioning in life function areas. Our concept of life functions is based on the assumption that a fully functioning person must:

-- operate on and negotiate the physical environment (Mobility)

-- have the physical well-being called good health (Health)

-- send and receive communications to other human beings (Communication)

1. *Mobility functions*. Limitation in the area of mobility includes difficulty using manual skills to manipulate objects or devices, difficulty locomoting within a living or working environment, and/or difficulty moving from place to place in the community.

2. *Health functions*. If impaired in this area, the person is lacking the general sense of physical well-being called good health; must devote a large part of his or her energies to staying alive or coping with pain; or must avoid activities which would risk life or well-being. If a condition is controlled - for example, if medicine can eliminate the risk of an epileptic seizure as long as it is taken - the person is not limited in the health functions area. If, however, needs for continuing treatment interfere with living and working, a limitation exists.

Mental health has been deleted from this category so that it more squarely focuses on physical health.

3. *Communication functions*. If impaired, the person has difficulty sending and/or receiving messages from other persons, either because of impairment in the senses or mechanisms of communication or because the content of communication is deviant (as in the case of the mentally ill).

4. *Cognitive-intellectual functions*. The person has difficulty intellectually manipulating symbols and objects, acquiring new cognitions and behaviors, and/or transferring learning to new situations. The impairment can be congenital or it can be environmentally caused. The mentally ill, and even the alcoholic or drug abuser, may have difficulty learning or transferring learning to new settings. The problem can be slow learning or distorted thought and perception.

5. *Social-attitudinal functions*. If impaired, the person cannot accept himself and his abilities, has difficulty relating to other people, or is not motivated to improve himself as a member of the community or labor force. Although impairment in this area may be directly caused by society's intolerance or misconceptions, we are concerned only with the way the disabled person feels about himself and relates to others - whatever the cause.

Figure 3-1. The five life functions

-- cognitively process events, learn, and apply learning (Cognitive-intellectual functioning)

-- feel positively about himself and negotiate social situations (Social-attitudinal functioning)

It is still possible, however, for two persons to have similar disabilities - as represented by need statements in the life function areas - but different life outcomes in terms of membership in the community and membership in the labor force. This is where the concept of handicap, or the interaction between disability (and probably impairment) and the environment, comes into play.

The Urban Institute (1975) report states that "Individuals with the most severe disabilities are almost always faced with the most severe handicaps" (p. 24). While this is often true, "almost always" may be too strong an adverbial. Take, for example, the epileptic whose seizures are under control. This person may have few life function needs - that is, little disability with respect to the performance of life functions. However, social attitudes toward epilepsy are extremely negative because of popular conceptions of the epileptic as someone who is out of control and foaming at the mouth. These negative attitudes manifest themselves in a reluctance to hire the epileptic and a desire to place great social distance between oneself and the epileptic. In this case, then, while the disability may be mild or nonexistent, the handicap is much more substantial. In other cases, a person might be less handicapped by disability if the environment were more benign. Though the quadriplegic is disabled as far as climbing stairs in concerned, his mobility would not be impeded if a barrier-free environment existed to allow him to roll up ramps or use elevators. Many other examples could be offered to illustrate the variable relationships between impairment, disability, and handicap.

Hence, the present model focuses on life function needs and on manifestations of these needs in the person's functioning as a member of the community and a member of the labor force (defined as life outcomes).

Community and labor force functioning are conceptualized as variables which are the outcome of: (1) impairment; (2) disability or life function needs, including the individual's reaction to his impairment; and, (3) influences associated with the physical, social, economic, and treatment environments. These relationships are represented in Figure 3-2.

The model is difficult to operationalize and at many points the distinctions among impairment, disability, and handicap break down. As mentioned previously, in the case of nonorganic conditions, the distinction between impairment and disability breaks down since behavioral symptoms are the basis for deciding that someone is schizophrenic, mentally retarded, and so on. Furthermore, in identifying life function needs, we have often given attention to other conditions which tend to co-occur with a disability. For example, diabetes is an identified cause of blindness, and those diabetics who are visually impaired are heir to the various kinds of needs which the visually impaired experience. However, our analysis only indicates that a certain

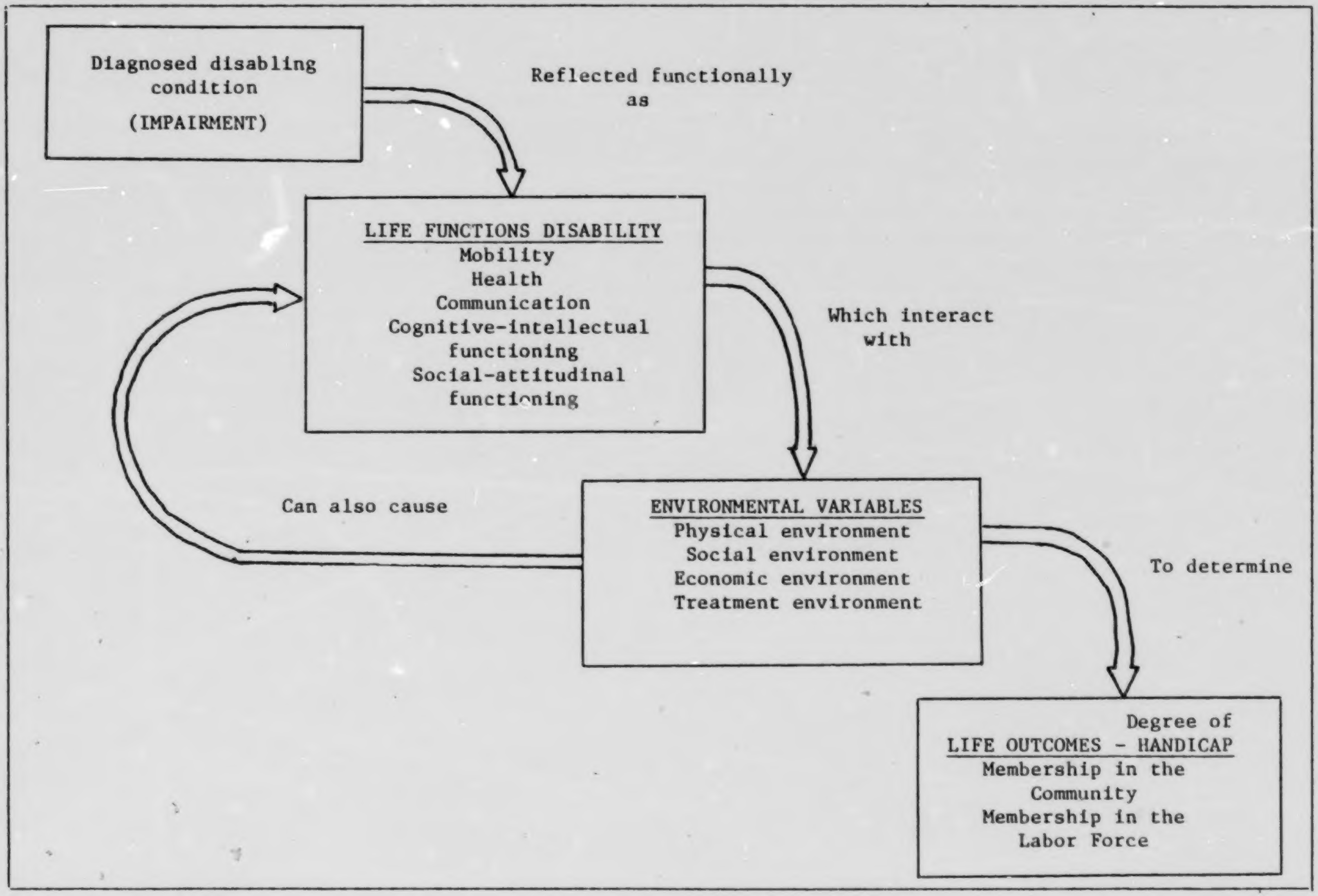
Diagnosed disabling condition
(IMPAIRMENT)
Reflected functionally as
LIFE FUNCTIONS DISABILITY
Mobility
Health
Communication
Cognitive-intellectual functioning
Social-attitudinal functioning
Which interact with
ENVIRONMENTAL VARIABLES
Physical environment
Social environment
Economic environment
Treatment environment
Can also cause
To determine
Degree of
LIFE OUTCOMES - HANDICAP
Membership in the Community
Membership in the Labor Force

Figure 3-2. Model: scope of the problem of disability

proportion of diabetics are visually impaired and does not detail all the needs associated with visual impairment. In this way, then, impairments - at least secondary impairments - have found their way into the life functions statements but are not described in all their ramifications.

Another difficulty is that it is almost impossible to maintain a distinction between disability and handicap. Since disabled people function within an environment which is not ideal for them, one cannot readily determine which of their handicaps might be eliminated if the environment were altered. In many cases, however, it is clear that a group has needs centered on objects in the current environment - curbs, stairs, and so on. Furthermore, there is a very important subset of life function needs which has its roots in the types of treatments or technologies currently applied to the disability group.

In the diagram, this thinking is portrayed as a reciprocal arrow between life functions and environmental influences. The needs manifested by a disabled individual shape to some extent the environment in which they function, just as the environment shapes needs . The whole causal process is even more complex. For example, the disabled person with a low self-concept may acquire a low self-concept because he cannot move about independently - the life functions, then, interact with one another. His low self-concept may also be caused by his wife's devaluation of him now that he is "less than a whole man." Once his self-concept is low, he may be devalued by employers, neighbors and others who now perceive him as a weak person who lacks confidence. And all of these complex interactions will affect his status as a member of the community and member of the labor force. Although more arrows properly belong in the diagram, only the interconnections which played a prominent part in the analysis of the scope of the problem of disability are portrayed here.

SELECTION OF CASE STUDY DISABILITIES AND METHODOLOGY

It was apparent from the outset that the scope of the technology assessment had to be delimited, and that one way to do so was to limit the number of disability groups which would be the subject of intensive analysis concerning the problems of disability. Preliminary searches for prevalence-incidence figures and analysis of current legislation in Vocational Rehabilitation and Developmental Disabilities served as guides to the selection of case study disabilities.

The Case Study Disabilities (CSDs) are not in any way a random sample of the disabled population; rather, they are disabilities which met several criteria set by the technology assessment team. The first step in selection was a decision to work within the major categories of disability used by the Social Security Survey of the Disabled: 1966 and established by the Manual of International Statistical Classification of Diseases, Injuries, and Causes of Death (1957). With the exception of "Neoplasms" and "Other and Not Specified Conditions," these categories pertain to the site of impairment and are listed in Figure 3-3.

The aim was to select at least one condition or impairment from each of the nine categories, including more than one from a category where the nature and effects of two conditions within the category were judged quite different. The selection of disabilities was guided by the following criteria:

(1) The disability should be prevalent, affecting at least 200,000 persons in the U.S. population, and hence representing a class of impairment in which major national effort might be or is

Nervous System Disorders

Paralysis or loss of motor control associated with:
Stroke (ST)
Traumatic spinal cord injury (SCI)
Cerebral Palsy (CP)

Epilepsy (EP)

Mental Disorders

Mental Retardation (MR)
Schizophrenia (SZ)

Musculo-Skeletal Disorders

Rheumatoid Arthritis (RA)

Cardiovascular Disorders

Coronary Heart Disease (CHD)

Respiratory and Related Disorders

Emphysema (EM)

Digestive Disorders

Colon/Rectum Cancer (CRC)

Urogenital Disorders

Kidney Diseases (KD)

Endocrine-Metabolic Disorders

Diabetes Mellitus (DM)

Sense Organ Disorders

Visual Impairment (VI)
Hearing Impairment (HI)

Figure 3-3. Case study disabilities to serve as focus of technology assessment of human rehabilitation techniques.

directed.

(2) The disability should be one which often results in *severe* functional limitation. Social Security Survey figures estimating severity served as a guide, as did the guidelines for the Rehabilitation Act of 1973 specifying several conditions which are associated with severe handicap as defined by the law.

(3) The disability should be of a *chronic* rather than an acute nature, having relatively enduring effects on life functions. By contrast, in many of the general surveys on disability, short-term incapacitating illnesses and injuries qualify one to be counted as disabled.

(4) The disability should be one *with survivors*, not one which almost inevitably results in death. That is, there should be people with the condition who are alive, either in convalescence or chronically disabled, who need rehabilitation rather than life saving services.

(5) The disability should not be a simple function of old age but rather should be one *affecting a wide age range*, including children and/or adults in their working years.

The case study disabilities, then, were intended to represent a wide variety of sites of impairment, a large segment of the entire disabled population, and the segments of the disabled population most in need of rehabilitation services. The case study disabilities are also listed in Figure 3-3. Although some do not meet all of the five criteria to the letter, each is largely in keeping with the spirit of the criteria.

The 14 disabilities together represent a wide variety of needs. The list includes a large number of chronic diseases, in keeping with the fact that a majority of all disabilities are associated with chronic disease. Arteriosclerosis, for example, is a major problem underlying heart conditions as well as stroke, and intimately involved in kidney diseases. Two disabilities - mental retardation and schizophrenia - were selected to represent the Mental Disorders because both are prevalent and yet the two are quite different in etiology and impact. In the Nervous System Disorders category, epilepsy and three other conditions - cerebral palsy, stroke, and spinal cord injury - were selected. Each of the latter three is associated with paralysis or loss of motor control, and yet was deemed to be distinct enough to require separate analysis, particularly since all three conditions are classified as severe disabilities in the guidelines to the Vocational Rehabilitation Act of 1973. The list ends with the two major sensory impairments, visual and hearing impairments. Within the list, all three of the major developmental disabilities - mental retardation, cerebral palsy, and epilepsy - are represented, with only autism, a less prevalent condition, omitted.

Rehabilitation Services Administration Definition of the Severely Handicapped

According to the HEW regulations pertaining to the Rehabilitation Act of 1973, a severely handicapped person:

> Has a severe physical or mental disability which seriously limits his functional capacities (mobility, communication, self-care, self-direction, work therapy or work skills) in terms of employability; whose vocational rehabilitation can be expected to require multiple vocational rehabilitation services over an extended period of time; and who has

> one or more physical or mental disabilities resulting from amputation, arthritis, blindness, cancer, cerebral palsy, cystic fibrosis, deafness, heart disease, hemiplegia, hemophilia, respiratory or pulmonary dysfunction, mental retardation, mental illness, multiple sclerosis, muscular dystrophy, musculo-skeletal disorders, neurological disorders including stroke and epilepsy, paraplegia, quadriplegia, and other spinal cord conditions, sickle cell anemia and end-stage renal disease, or another disability or combination of disabilities determined on the basis of an evaluation of rehabilitation potential to cause comparable substantial functional limitation.

Of the fourteen case study disabilities, in the present technology assessment, only diabetes is not specifically named in the regulations, although diabetes too has been known to underlie severe limitation in some cases and require multiple services over an extended period of time. The definition is open to varying interpretations. A severely handicapped person is supposed to have seriously limited capacity and a need for multiple services over time, suggesting that the mere fact that a person has arthritis, heart disease or one of the other listed disabilities is not sufficient to define him as severely handicapped. However, definitions of seriousness of limitation and need for services may vary considerably.

In summary, the basic objectives in selecting case study disabilities was to delimit the scope of the study enough to permit detailed analysis of disabilities which lie at the core of the broader problem of disability in the United States.

Method of Disability Analysis

The literature on each case study disability was reviewed by one researcher following a detailed format which covered the following areas:

I. Definitions of the Disability Group and Subgroups

II. Prevalence-Incidence-Cost Estimates

  A. Prevalence

  B. Incidence

  C. Mortality

  D. Costs

  E. Projected prevalence

III. Demographic Distribution of the Disability

  A. Age

  B. Sex

  C. Ethnicity

  D. Socioeconomic status-education

  E. Urban-rural distribution

  F. Regional distribution

IV. Etiology

V. Life Functions

  A. Health

  B. Mobility

  C. Communication

  D. Cognitive-Intellectual Functioning

  E. Social-Attitudinal Functioning

VI. Functioning as a Member of the Labor Force and Member of the Community

VII. Technologies Applied to the Group

VIII. Service Delivery System

Researchers were instructed to be most thorough with respect to sections II and V of the Case Study Disability Report. In particular, they were to attempt to find at least three figures on the prevalence of the disability and two figures on its incidence in order that analyses of discrepancies among estimates could be conducted. The major emphasis in data collection was placed on the construction of life function tables listing specific statements of impairments according to the following format:

(1) A need statement specifying an impairment or deficit in functioning which affects some portion of the disability group.

(2) The dynamics of the need statement - numbers or subgroups of the disability group affected, stage in the course of the disability during which the need occurs, and factors associated with the occurrence of the need.

(3) Source of the information.

Need statements were to be constructed at the level of abstractness characteristic of statements in journal abstracts. It soon became apparent, however, that need statements appearing in the literature took many forms. Where knowledge is detailed and empirical research is conducted, needs or deficits are likely to be well documented and very specific. The bodies of literature on mental retardation, schizophrenia, blindness, and hearing impairment, for example, are voluminous, so that need statements very often were statements appearing in journal abstracts with some supportive detail. For many of the chronic diseases, however, research on life function deficits is primitive and need statements were often symptoms mentioned in medical textbooks and articles but not typically substantiated by research.

DEFINING DISABILITIES

The basis for any attack on the problems of disability is an understanding of what disability is and who is affected by it. Diagnostic labels originally evolved as a means of determining which persons were eligible for special services and which treatments and services might be most effective with them. Ideally, a diagnosis should provide a full account of the needs of the disabled person as a justification and guide for rehabilitation efforts. However, our analysis of case study disabilities suggests that problems in defining and classifying disability are an important facet of the larger problem of disability in the nation.

Definitional Problems

Some disabilities, particularly chronic diseases, would seemingly be easy to identify, for they are associated with organic involvements and symptoms which can be recognized through medical examination technologies. Once the presence of coronary heart disease, emphysema, or diabetes, for example, is established, diagnosis might proceed to describing the degree of limitation in functioning. Other disabilities - most notably the behavioral disabilities of mental retardation and schizophrenia and the sensory impairments of vision and hearing - are, from the start, a matter of degree. The task of the diagnostician is to determine that a person deviates significantly from the norm with respect to intellectual functioning, behavioral pattern, ability to see, or ability to hear. The definitional problems in these cases are more severe since any number of cut-off points, all more or less arbitrary, can be set. However, we would have to conclude that virtually no case study disability is free of definitional problems. This can be best illustrated through a description of some of the problems encountered.

1. Confusion of Terms: Synonyms and Near Synonyms. The words arthritis and rheumatism are used loosely and often synonymously to refer to unexplained inflammation associated with aches and pains in the joints and muscles. While rheumatoid arthritis is more specifically defined, it is confused with polyarthritis - inflammation of several joints together - which is a broader diagnostic category. Rheumatoid arthritis is also called atrophic arthritis, chronic infectious arthritis, and proliferative arthritis. Lacking knowledge of etiology, there would seem to be ample opportunity for confusion of terms as well as diagnosis.

In the case of stroke, there is general consensus that stroke is recognizable as a neurological deficit or cerebral dysfunction caused by a disturbance of the blood supply to the brain. Yet in some cases, it is defined as the organic precipitating event - e.g., thrombosis or embolism, rupturing or closing of an atery while other times it is defined primarily in terms of the neurological results. Hence, the term stroke is often used synonymously with apoplexy; cerebrovascular accident, embolism, hemorrhage, infarct, or thrombosis; hemiparesis or hemiplegia; and so on.

Similarly, in labeling coronary heart disease, terms are used synonymously when they were not meant to be - terms such as coronary artery disease, atherosclerotic heart disease, coronary atherosclerotic heart disease and ischemic heart disease. Although some investigators make crisp distinctions among terms, most use one or another loosely.

For almost every case study disability, there are several alternative terms in use. While this may be little more than a commentary on the habits of English speakers, when different terms do not have different functions but are used loosely, it suggests a conceptual problem.

2. Difficulties in Operationalizing Definitions. Emphysema has been defined as an anatomical disorder characterized by "...an increase beyond the normal in the size of air spaces distal to the terminal bronchioles (of the lung) with destructive changes in their walls" (Baum, 1974). This is the accepted definition of the American Thoracic Society, the American Lung Association, and Dorland's Illustrated Medical Dictionary. However, since this definition specifies an anatomical defect which may not be apparent until a post-mortem autopsy, many rely on clinical manifestations in diagnosis and infer anatomical defect. This means that the terms chronic obstructive lung disease, chronic bronchitis, or chronic obstructive pulmonary disease may be used. However, these terms based on clinical manifestation - primarily obstruction of the airways - are descriptive of the later stages of emphysema and do not define mild and moderate stages when obstruction of the airways is not yet present (Rodman & Sterling, 1969).

In the case of mental retardation, a generally agreed upon definition exists:

Mental retardation refers to significantly subaverage gen-

> eral intellectual functioning existing concurrently with deficits in adaptive behavior, and manifested during the developmental period (Grossman, 1973).

However, operationalization of the definition has been extremely problematic. Significantly subaverage general intellectual functioning has been defined in terms of number of standard deviations below the mean on IQ tests, but since different tests yield different scores, cut-off points must be specified for each test. Intelligence tests scores are influenced by a variety of factors other than "intelligence," so that test-taking behaviors and conditions of testing add error to scores. Special difficulties have been encountered in obtaining accurate scores for minority group members when language or dialect differences, differences in cultural experiences, and psychological factors in the testing situation often depress scores.

Due to the problems in obtaining valid IQ scores, a second criterion of mental retardation - deficits in adaptive behavior - was added to the definition. When measures of adaptive behavior are taken along with IQ test performance, many previously "retarded" persons, particularly those in minority groups, are no longer retarded because they are able to adapt to "standards of personal independence and social responsibility" expected of their age and cultural group (Mercer, 1973). This definition of adaptive behavior, however, is itself poorly operationalized and subject to cultural bias.

The concept of adaptive behavior is in many ways similar to the concept of "normal" behavior or "sane" behavior used in identifying the mentally ill. In one study (Rosenhan, 1973), eight pseudopatients presented themselves to mental hospitals complaining that they had been hearing voices. They were rapidly admitted, labeled as schizophrenic, and never detected as pseudopatients though they acted normally within the institutions. Rosenhan concluded that physicians operating within a medical model are more inclined to call a healthy person sick than to make the reverse error. While this bias might be a wise precaution in diagnosing physical illness, it is dangerous in diagnosis of mental illness, primarily because of the stigma attacked to the label, the tendency for the label to start a self-fulfilling prophecy in motion, and the difficulty of removing the label once it has been applied.

3. Levels of Definition and the Lack of Functional Definitions. Definitions of disabilities do not indicate the nature of the specific functional handicaps which the disabled person must live with, though some are more complete than others. The two major emphases in definitions have been nature of organic involvement and clinical manifestations. Several disabilities - notably coronary heart disease, emphysema, rheumatoid arthritis, diabetes, and cancer of the colon-rectum - are defined primarily in terms of organic involvement. That is, coronary heart disease is defined as obstruction or narrowing of the coronary arteries; emphysema as an increase in the size of air spaces in the lung tissue and destruction of air space walls; diabetes as a deficiency in the production of insulin in the pancreas; rheumatoid arthri-

tis as a disease of the joints marked by inflammation and atrophy of tissue structures and rarefaction of the bones; and cancer of the colon-rectum as a carcinoma of particular types of cells. Definitions in terms of organic involvement do not indicate what the major problems associated with the condition are - e.g., they do not indicate that the emphysema patient has difficulty breathing or that the person with rheumatoid arthritis has difficulty moving the extremities without pain.

The next level of definition is more adequate in that it focuses on the major clinical manifestations or limitations associated with the condition. Thus the spinal cord injured, paraplegics and quadriplegics, are defined as paralyzed in specified extremities; the patient with kidney disease is defined as having an impairment in the functioning of the kidneys which eventually can lead to renal failure; stroke is often defined in terms of its neurological consequences; and so on.

In the case of epilepsy, definitions typically specify cause (abnormal electrical discharges of the brain cells) and primary symptom (seizures). The Epilepsy Foundation of America goes on to define seizures, but some argue that a large part of the symptomatology of epilepsy is not convulsive and that the terms "epilepsy" and "convulsive disorders" should not be used synonymously (Boshes & Gibbs, 1972). While these authors may have had in mind other clinical or electroencephalographic manifestations, there is a larger problem with the emphasis on seizures. According to Connor, Hoover, Horton, Sands, Sternfeld & Wolinsky (1975),

> ...to limit attention to this single factor and not to discover or give the proper weight

> to the other variables that are associated with the disorder - variables that do not necessarily disappear when the seizures are eliminated - is to define incompletely the handicapping condition of epilepsy.

These authors had in mind not only such things as type of seizures and age at onset of seizures, but also other physical disabilities and psychological problems - in short, something approaching a definition in terms of life function needs.

Some definitions in terms of clinical manifestations are more inclusive than others. For example, cerebral palsy is defined in terms of major impairments, age of onset, and etiology (pathology of the motor control centers of the brain). A definition by the United Cerebral Palsy Research and Education Foundation (1958) focuses on paralysis, weakness, and incoordination as impairments of motor function but also adds that cerebral palsy may include "learning difficulties, psychological problems, sensory defects, convulsive and behavioral disorders of genetic origin." The definition, then, while vague in many ways, attempts to specify major areas of deficiency with respect not only to motor functioning but other areas of functioning.

The closest approximations to a third level - functional definition of disability - appear with respect to hearing impairments. For example, degrees of impairment ranging from slight to extreme have been developed by the Illinois Commission on Children (1968), with each level defined in terms of decibel loss based on pure tone testing but also described in terms of functional impairment. For example, severe impairment, as contrasted to extreme impairment, means that loud voices about a foot from the ear can be heard, that the person can discriminate vowels but not all consonants, and that the child probably has a need for special education services, including a full-time program for the deaf and a hearing aid.

4. Competition among Definitions vs. Definitional Standardization. A definitional issue quite distinct from confusion of terms concerns the relative merits of having in use several competing definitions or one standard and widely accepted definition. Two sides of the issue can be illustrated by analyzing definitions of visual impairment and hearing impairment.

In the case of hearing impairment, competition among definitions is active. There has been an attempt to define hearing loss in terms of a standard test using pure tone thresholds as standards. The American Standards Association developed a set of reference thresholds in 1951, but in 1964 the International Standards Association adopted revised, competing reference thresholds. Now ASA, renamed the American National Standards Institute, has switched to ISO reference thresholds, and there is more consensus on criteria of hearing impairments ranging from slight to extreme.

However, many in the field argue that pure tone testing alone is not adequate in defining a person as hearing impaired. Although there is more room for disagreement in setting criteria for hearing impairment than in setting criteria for its more severe form, deafness, the confusion even with respect to deafness is pronounced. Issues concern the following:

1. Whether a hearing loss must be permanent
2. Whether etiology must enter into the definition
3. Whether a particular portion of the auditory mechanism

(e.g., sensorineural or conductive subsystems) must be affected

4. Whether age at which deafness occurred must be taken into account

5. Whether the term should be limited to those who are mute as well as deaf

6. Whether a hearing loss in one ear should qualify one as deaf

7. Whether definitions should stipulate likelihoods of improving hearing through correction

8. Whether a hearing loss beyond a single point on a continuum should be taken to signify deafness or whether all hearing losses should be described as degrees of impairment

9. Whether speech reception thresholds must be determined along with pure tone thresholds.

Many of these points have been incorporated in classification systems. For example, most authorities distinguish among conductive losses (dysfunction in the outer or middle ear), sensorineural losses (nerve or central impairment), and mixed losses. Since many argue that definitions must describe functional ability to participation in oral communication or to hear everyday speech, a number of authors and organizations have developed functional definitions which incorporate some of the issues stated above. Different social institutions - for example, educational agencies, medicine, the military - have developed their own definitions for purposes of eligibility determination and diagnosis.

The obvious result of this degree of competition among definitions is a great deal of confusion about who is deaf or hearing impaired. A person might easily be considered hearing impaired by one social institution but not by another, or be considered hearing impaired at one stage in life but not later, or be classified as deaf despite an ability to participate in everyday conversation with corrective technologies.

While there is also disagreement as to how blindness and visual impairment should be defined, there is a legal definition of blindness which has enjoyed widespread acceptance and stands far above other competing definitions. The basic definition originated in 1934 with an American Medical Association meeting. As defined in the Social Security Act of 1967, it reads:

> An individual shall be considered to be blind if he has a central visual acuity of 20/200 or less in the better eye with the use of a corrective lens. An eye which is accompanied by a limitation in the fields of vision such that the widest diameter of the visual field subtends an angle no greater than 20 degrees should be considered for the purposes of the first sentence of this subsection as having central visual acuity of 20/200 or less.

While the existence of a standard definition would appear to be advantagious, this is not clearly the case. Within this definition of blindness are subsumed those who have no sense of vision as well as clients who have an impaired sense of vision. This fosters the assumption that all of the "blind" have the same needs. In addition, testing of vision based on the Snellen Visual Acuity Chart measures distance vision, when other aspects of vision such as near vision or uniformity of the visual field may have much more to do with reading ability and other important life functions. Even Snellen testing is unreliable if conditions of administration or interpretations of performance are altered.

While meeting the legal definition gains a person access to the service system for the blind, its imperfect correlation to functional need means that some who make it into the system do not need many services while others who fail to qualify could benefit from services for the blind.

Several difficulties have been identified by OSTI (1971). The Books for the Blind program of the Library of Congress excludes those with better than 20/200 visual acuity who nonetheless cannot read regular size print. The needs of the totally blind are not always addressed adequately when emphasis is placed on aids for those who have some remaining vision, nor are the special needs of the partially blind fully accounted for. Many persons are reluctant to avail themselves of services for the "blind" when they have some degree of vision and do not consider themselves blind or do not wish to assume that label.

In summary, definitional difficulties are apparent for both visual and hearing impairment. Without standardization of definitions, no one knows who is disabled. But a standardized definition may be as problematic as definitional chaos if the definition is not an accurate index of need for special services.

In most rehabilitation fields, many attempts have been made to improve definitions of disability, but in many ways, it would appear that unambiguous definition, while possible, is not always desirable. What may be more important is the effort to develop classification systems based on functional needs for service such that any individual is not just blind or deaf but a person with a particular constellation of needs in daily living and a particular constellation of service needs.

Classification Systems

If definitions of disabilities do not typically address themselves to broad constellations of functional needs experienced by the disabled person, do classification systems do so? The answer is largely negative, since the same problems which plague definitions plague attempts at classification of subgroups within a disability group.

For some disability groups - for example, kidney disease, stroke, and coronary heart disease - very little effort has been directed toward developing indexes of severity or type of impairment; instead classification schemes tend to be framed in terms of etiology or locus of organic involvement. In the cases of arthritis and diabetes, distinctions are made between juvenile and adult forms and their courses and symptoms, but there is considerable controversy as to whether such distinctions are sound. For physical disabilities of cerebral palsy and spinal cord injury, classification systems have focused on both the locus of the physiological impairment (e.g., region of the spinal cord) and on the locus of the dysfunction (paraplegic, hemiplegic, quadriplegic). However, these breakdowns are only rough guides to the extent and nature of a person's limitations. Similarly, for visual and hearing impairments as well as for mental retardation, classifiers have established degrees of impairment based on test results - ranging from mild impairments of vision, hearing, or intellectual functioning to severe or profound impairments. Again, without taking into account other characteristics of the disabled person, including secondary impairments, such classification systems cannot serve as more than a rough gauge of service needs.

Because of problems in operationalizing definitions, classifications of schizophrenia reflect the underlying problem of deciding who is mentally ill and who is not. Since schizophrenia is defined generally in terms of disturbances of thinking, mood, and behavior, subtypes are defined in terms of behavior symptoms, but categorization is unreliable. Other distinctions have been made on the basis of course of onset and/or prognosis. For example, true schizophrenia, which is a deteriorating condition in which recovery is rare, is distinguished from a schizophreniform condition, precipitated by stress and with good prognosis. Somewhat similar distinctions incorporating rate of onset and reversibility are made between process and reactive types and between chronic and acute types. All of these say much the same thing, which is to say little, about functional need.

In the case of arthritis, a "semi-quantitive" method of estimating degrees of disease activity has been developed by the American Rheumatism Association Committee on Diagnostic and Therapeutic Criteria (1962). The scale has subjective, functional, and objective criteria to permit ratings of inactive, minimal, moderate or severe degrees of such symptoms as morning stiffness, pain, and grip strength. A similar tool is the Activity Index, which also attempts to score disease activity and, by inference, functional need. Functional classes ranging from IV, bedridden or confined to a wheelchair, to I, ability to carry on usual duties without handicaps, also help to describe disability.

The most promising alternatives appear to be multidimensional classification systems. For example, cerebral palsy, as indicated previously, is defined with reference to associated impairments. Its forms are classified according to predominant neuromotor patterns as spasticity, athetosis, ataxia, rigidity, tremors and mixed conditions. Classification by location of motor dysfunction adds information by describing whether the legs only, all four extremities, the arm and leg of one side of the body, or one extremity only are affected. Add to this classification in terms of degree of severity and description of associated disabilities, and one has a fairly descriptive index of functional needs.

Many more innovative classification schemes have been developed in the field, many of which would ameliorate the problems described here. But these systems need to be disseminated and institutionalized for the state of the art in diagnosis and classification to improve substantially.

THE PREVALENCE OF DISABILITY

This section provides a rather brief guide to the prevalence of disability in the U.S. Incidence and mortality figures are not presented, in part because of their complexity and in part because prevalence estimates - which indicate the number of disabled persons on hand at any point in time - are a better basis for determining numbers of persons needing rehabilitation services. The section does not offer accurate figures on the prevalence of disability but rather provides some estimates and explores why estimates are difficult to calculate. The search for accurate prevalence figures is in a class with the search for an honest man.

General Estimates of the Size of the Disabled Population

The President's Committee on Employment of the Handicapped, in its analysis of 1970 Census information, has indicated that one in eleven adults is disabled. The Urban Institute (1975), in its Report of the Comprehensive Service Needs Study, provided a table summarizing the findings of four major surveys, limiting the estimates to those for the population aged 18 to 64 (see Table 3-1). In percents of the population, these estimates range from a low of 8.9% of the population in the Health Interview Survey to a high of 17.3% in the Survey of Disabled Adults. It must be recognized, of course, that these surveys were done at different times, asked different questions, and differed in other respects methodologically.

On the basis of the Survey of Disabled Adults, updated by extrapolation from the Health Interview Survey data, the Urban Institute estimated that in 1975 there were, in the 18-64 age

TABLE 3-1

ESTIMATES OF THE DISABLED POPULATION OF WORKING AGE DELIVERED FROM ALTERNATIVE SURVEYS, BY DEGREE OF SEVERITY

(in millions)

	All Disabled			Disabled With Complete Work Disability		
	male	female	total	male	female	total
Survey of Disabled Adults (1966)	8.4	9.3	17.7	1.6	2.1	3.7
Census of Population (1970)	6.4	5.7	12.1	1.8	2.8	4.6
Health Interview Survey (1969-70)	3.3	4.3	7.6	1.8	0.6	2.5
Ohio State University Survey (1972)	4.6	7.4	12.0	2.5	4.5	7.0

Sources: Urban Institute cross-tabulation of the SDA data file and the Census Public Use Sample file; U.S. National Center for Health Statistics, Series 10, No. 80, Tables 1, E; Nagi, "Disability and the Severely Disabled," Table 7, p. 35.

Note: This table appeared in : The Urban Institute, Report of the comprehensive needs study. Washington, D.C.: The Urban Institute, 1973, p. 59.

range, 23.3 million disabled persons (18.7% of the population) - 4.2 million most severely disabled, 3.9 million severely disabled, and 15.2 million partially disabled. These figures are based on a total U.S. population of 124,800,000 in the 18-64 age range. Adding 3.9 million people over 65 to the 4.2 million "most severely disabled" - those whose health keeps them from working or who are not in the labor force - raises the estimate for this category of the disabled to 8.1 million.

These figures are high. It should be noted that the Survey of Disabled Adults asked about disability which involved a "limitation in the kind or amount of work (or housework) resulting from a chronic health condition or impairment, lasting six months or longer."

The present technology assessment focuses on the most severely disabled and severely disabled populations described by the Urban Institute. It focuses most squarely on those who remain in the disabled population for many years rather than on those suffering short-term disability. A closer look at the prevalence of case study disabilities aids in identifying the many difficulties in prevalence estimation.

Prevalence Estimates for the Case Study Disabilities

Table 3-2 is an oversimplified synopsis of some of the major prevalence estimates, each of them converted to rough percentages of the population. Many judgments had to be made in constructing this table.

First, very old estimates based on radically different definitions of disability from those used in most other studies were eliminated from consideration. Thus, an attempt was made to identify a fairly "reasonable" low prevalence rate, and a "reasonable" high prevalence rate, although much greater discrepancies in the literature were sometimes apparent. In the "Best Estimate" column, we report either what appears to be the central tendency of various estimates, an estimate based on a particularly sound study, or the figure most commonly cited and used in the field, unless there is considerable evidence suggesting its inaccuracy. This is the very case with respect to mental retardation, where the most commonly used figure is 3% of the general population, an estimate based on the normal distribution of intelligence test scores. Actual epidemiologic surveys contradict this figure, however, indicating that while the 3% rate might be reasonably accurate for persons under age 18, 1% of the population is more accurate for persons 18 and older. Finally, when numbers of people affected had to be converted to percentages, the total population as reported in the Census (approximately 180 million in 1960 and 203 million in 1970, whichever year was closest to the date of the prevalence study) was used as the denominator, although this yielded very rough estimates.

Table 3-2 provides some indication of the relative prevalences of the various disabilities. However, it raises more questions than it answers. If the various best estimate rates are added across disabilities, for example, a total of 20.4 percent of the population would be disabled by case study disabilities, which do not include all disabilities. The sum of the low figures is 13% while the sum of the high figures is 31%. A large part of these high figures is accounted for by hearing and visual impairments,

TABLE 3-2

ESTIMATES OF THE PREVALENCE OF FOURTEEN CASE STUDY DISABILITIES (IN ROUGH PERCENTS OF THE POPULATION)

Disability	Low Figure	High Figure	Best Estimate	Comments
Stroke	.8	1.1	.8	Head counts.
Spinal cord injury	.06	.08	.08	Little information.
Cerebral palsy	.1	.4	.3	Fairly stable rates.
Epilepsy	.2	1.9	.5	1-2% including undetected.
Mental Retardation	1.0	3.0	2.0	1% for adults, 3% for school-aged.
Schizophrenia	.1	.4	.3	Fairly stable rates.
Rheumatoid arthritis	1.0	6.7	1.5	Confused with other forms. Arthritis Foundation says 1 or 2%.
Coronary Heart disease	1.7	2.8	2.0	Very rough due to differences in terms.
Emphysema	.5	.6	.6	Little information.
Colon/Rectum cancer			.2	Based on extrapolation from incidence and survival.
Kidney diseases				Too complex for analysis. Estimated 2-3. 3 million have undiagnosed cases. 5,000 on dialysis. Figures for some diseases available.

TABLE 3-2

ESTIMATES OF THE PREVALENCE OF FOURTEEN CASE STUDY DISABILITIES (IN ROUGH PERCENTS OF THE POPULATION) con't.

Disability	Low Figure	High Figure	Best Estimate	Comments
Diabetes mellitus	1.0	2.0	1.5	Known cases only: almost doubles if estimate unknown.
Visual impairment	1.2	4.8	3.0	Blind estimates more stable.
Legally blind or blind	.1	.6	.4	
Hearing impairment	5.4	7.3	6.6	Deaf estimates more stable.
Prevocationally deaf	.1	.2	.2	

of all severities including the very mild. The "best estimates" would indicate that almost 10% of the population is sense disabled. However, the interrelatedness of disabilities makes it invalid to sum prevalence rates in this manner. As an analysis in the Life Functions section of this report will show, persons with one disability often have one or more other disability. Most estimates of the prevalence of a given disability are based on all persons who have the disability in question, even if they have others, so that many multiply handicapped persons contribute to high prevalence rates for two or more conditions.

On the other hand, the case study disabilities were selected to represent a majority of the disabled population as a whole and it would appear that they do so. The most prevalent disabilities would appear to be hearing impairment, visual impairment, coronary heart disease, diabetes, arthritis, mental retardation, and epilepsy, each of which includes severity levels ranging from the very mild to the very severe.

Although the scope of the problem of disability in terms of size of the population affected can be specified fairly well in some cases, one would have to conclude overall that present knowledge is lacking and does not provide a solid basis for program planning. Without going into details, the following represent some of the obstacles to accurate prevalence determination.

1. Variation in Definitions of Disability. This problem plagues both the general censuses of the disabled and the studies of specific disabilities. As discussed in the section on Defining Disabilities, virtually no case study disability was unambiguously defined, and hence it is not surprising that a variety of defini-

tions were operationalized in epidemiological studies.

2. Other Methodological Differences. Not only are studies carried out at different points in time and in different locales, but their basic methodologies differ considerably--all the way from inferential estimates (e.g., the estimation of the prevalence of mental retardation on the basis of the normal curve distribution) to mail surveys, to door-to-door canvasses, to analysis of patient records, to actual screening or testing of samples of the general population.

3. Hidden or Undetected Disabilities. In many instances, researchers have attempted to estimate numbers of persons who do not identify themselves as disabled or do not seek and receive special services. As was pointed out in the prevalence table, epilepsy would appear to have a relatively low prevalence based on survey results. But many epileptics attempt to conceal their condition and diagnosis of epilepsy is not reportable in most states. Although it is likely that many of the undetected cases are mild, one must be concerned with "latent" cases. The Epilepsy Foundation of America's (1975) conclusion is that at least two percent of the population suffer from "the commonly recognized forms of epilepsy plus numerous other, often unidentified, epileptiform manifestations." In other cases as well, detection is difficult. Joint biopsies cannot be conducted in field studies of rheumatoid arthritis; lung structure cannot be examined to decide unambiguously whether a person has emphysema or some other pulmonary difficulty. Yet, estimation of unknown, undetected, hidden, or latent cases is likely to be much less reliable than estimation of known cases, and some figures, particularly those of voluntary organizations,

may be inflated.

4. Variations due to Onset and Course of Disability. The problems in estimating prevalence vary considerably according to the type of disability in question. For cancer and other disabilities with acute onsets and high mortality rates, the most useful statistics are those concerning annual incidence and mortality rates. The prevalence rate does not fully indicate the scope of the problem. For developmental disabilities, figures concerning live births can be used in conjunction with surveys of disabled persons surviving at various age levels. In the case of schizophrenia, where onset is gradual and where a person may enter, leave, and reenter the service system repeatedly, estimation becomes very complex and has its own peculiar methodologies.

5. Lack of National Data Gathering. Finally, although the Census type surveys are useful, there is not an institutionalized, periodic, national survey which examines in detail the occurrence of specific disabilities and their combinations in multiple handicapped individuals. This might be the only solution to the problem of multiple accounting.

Projected Trends in the Prevalence of Disability

It is virtually impossible to establish precise estimates of expected increases or decreases in the size of the disabled population and in the prevalence rates of various disabilities. It is possible to describe some of the predictions of authors in the field, and, more importantly, the contingencies upon which their predictions are based.

In the first place, due to sheer increases in population size, one would expect the number of disabled persons in the country to continue to increase as it has in the past. The more interesting question is whether the rate of disability will increase in the future. If present trends continue, the answer appears to be yes.

One major factor underlying this expectation is the increase in the life span and the concomitant increase in the percentage of the population which is elderly. Since many disabilities are associated with old age, prevalence rates would be expected to increase overall. This expectation has been mentioned explicitly in the literature on stroke, coronary heart disease, and rheumatoid arthritis. In the case of rheumatoid arthritis, the fact that female longevity has been increasing more rapidly than male longevity suggests that the 3 to 1 ratio of female to male rheumatoid arthritics might become even more imbalanced. Since arteriosclerosis, which is involved in both coronary heart disease and stroke, is a function of age, both of those disabilities would increase in prevalence as the average age of the population rises. Similar arguments have been made concerning both visual and hearing impairments.

A related trend is improved medical treatment, which partially underlies the increase in the life span. In the case of visual impairment, not only is a sheer increase in the proportion of older persons expected to increase the rate of blindness, but persons with disorders which can lead to blindness are more often surviving--for example, diabetics, whose life span has increased due to insulin treatment, various antibiotics, and improved early detection and treatment services. In the case of hearing impairment, victims of meningitis who suffer hearing damage are surviving at a greater rate. Improvements in medical care have also had a positive impact on the life spans of developmentally disabled persons. More mentally retarded and cerebral palsied infants and children are surviving early childhood and entering adulthood than in earlier decades.

Another set of factors which can be expected to affect prevalence rates consists of various environmental influences on health and well-being. The incidence of spinal cord injury has been increasing in conjunction with the rise in traffic and industrial accidents. This same rise in accidents underlies increases in the prevalence rate of kidney disorders. If these trends continue, one would expect continuation of the upward trend in prevalence. It has been suggested as well that environmental pollution is increasing the rate of disability. The rate of cancer recently took a large jump upward. Increases in the variety of nephrotoxic substances in the environment are expected to increase the incidence of kidney disease. "Noise pollution," particularly in urban areas, would lead one to expect an increase in hearing impairment due to acoustic trauma. One must consider, too, the possibility of new causes of disability or even new disabilities in the future.

For almost all of the case study disabilities, the expectation, if present trends continue, is an increase not only in the number of disabled persons but in their proportion of the total population. The contingencies which may result in decreases in prevalence rates concern primarily the introduction of prevention and cure technologies which attack disabilities or their causes. Life extending technologies which alter the aging process might substantially reduce the size of the disabled population. Changes in the environment which counteract rises in pollution and accidents, or which improve general health and living conditions, would also have a salutary effect. Finally, there is the possibility--particularly in the cases of mental retardation, schizophrenia, hearing impairment and visual impairment--that changes in definitional criteria or diagnostic procedures might be made which would increase or decrease the numbers of persons identified and labeled as disabled, if not the "true" rates of impairment. For example, the American Association on Mental Deficiency was able to "cure" borderline retardates by eliminating them from the definition of mental retardation; it or other groups could just as easily "create" mental retardation by broadening the definition in various ways.

DEMOGRAPHICS

Several studies have investigated the demographic and social characteristics of the disabled population in the United States. The purpose of such studies is to identify the people within the population who are most likely to be handicapped. For purposes of this study, the following demographic variables were examined: age, sex, ethnicity (white or minority), socioeconomic status (SES) or educational level, and urban-rural residence.

The table that accompanies this section (Table 3-3) describes how each case study disability is distributed demographically. Due to the unavailability of figures for each demographic category and discrepancies among data sources, the entries should be interpreted as representing general or overall trends. Question marks in the table indicate that the data were so conflicting that no conclusion could be drawn or that the literature on a disability group made no reference to that particular demographic variable.

TABLE 3-3

DEMOGRAPHIC DISTRIBUTIONS OF CASE STUDY DISABILITIES

Disability Group	Age	Sex	Ethnicity	SES[1]	Urban/Rural
Stroke	65 and over	No Trend	Minority	No Trend	Urban
Spinal Cord Injury	15-25	Male	Minority	No Trend	No Trend
Cerebral Palsy	0-18 years	Male	White	?	?
Epilepsy	0-18	Male	Minority	?	Urban
Mental Retardation	0-18	Male	Minority	Low	Urban
Schizophrenia	25-44	No Trend	Minority	Low	Urban
Rheumatoid Arthritis	over 40	Female	No Trend	No Trend	No Trend
Coronary Heart Disease	65 and over	Male	No Trend	Low	Urban
Emphysema	over 50	Male	White	Low	Urban
Colon/Rectum Cancer	over 55	Female	No Trend	?	Urban
Kidney Disease	?	Female	No Trend	?	?
Diabetes Mellitus	40-60	Female	Minority	Low	Urban
Visual Impairment	65 and over	?	Minority	Low	No Trend
Hearing Impairment	65 and over	Male	White	Low	Rural

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[1] Socioeconomic Status

The entry, "No trend," indicates, by contrast, that the disability has been found to be no more prevalent in one demographic subgroup than in another.

Age

Overall, the rate of disability in the United States has been found to increase with age. Approximately 4.5% of the 16-24 age group suffer from some kind of disabling condition. The rate increases to 5% for the 25-34 age group; 7.6% for the 35-44 age group; 12.7% for the 45-54 age group; and 21.0% for the 55-64 age group (President's Committee on Employment of the Handicapped, 1975). Disabled persons are most likely to be late middle-aged or elderly, considerably older than the general population of the United States (Allan & Cinsky, 1972). Of the entire population of the United States, two-thirds between the ages of 16 and 64 are less than 45 years old. Of the disabled population, two-thirds of the 16 to 64 age group are 45 years old and older (President's Committee on Employment of the Handicapped, 1975).

Of the fourteen disability groups which are the concern of this study, eight were found to be most prevalent in the 50 or 55 and over age group. The developmental disabilities of cerebral palsy, epilepsy, and mental retardation, not unexpectedly, were found to be most prevalent in the 0-18 year age bracket. Kidney disease, is distributed in varying degrees across age categories depending on the type of disorder and the diagnostic and classification system used by researchers. Of all the disability groups, only spinal cord injury, most prevalent in the 15-25 range, and schizophrenia, most prevalent in the 25-44 age category, were found to strike young and middle-aged adult groups with the greatest frequency. All the other disabilities are associated with old age or youth.

Sex

Though Allan and Cinsky (1972) have reported that the disabled adult is most likely to be female, other sources show that slightly more males than females are disabled. According to the President's Committee on Employment of the Handicapped (1975), 53% of the disabled population is male, while males make up only 49% of the general population. The slight preponderance of males over females in the disabled population is probably due to: (1) more societal resources aimed at helping the disabled male (e.g., The Veteran's Administration), and (2) more males in the labor force, since recognition of disability may be tied to participation in the labor force. Men also experience more potentially disabling situations due to the nature of their jobs and participation in the military services (U.S. Bureau of the Census, 1973). According to our findings, men appear to be only slightly more susceptible to a greater number of disabling conditions than are women. Seven of the 14 case study disabilities were found to be more prevalent among males (coronary heart disease, emphysema, spinal cord injury, cerebral palsy, hearing impairment, mental retardation, and epilepsy). On the other hand, there was evidence that diabetes, colon/rectum cancer, kidney disease, and most notably rheumatoid arthritis with a 3 to 1 ratio favoring females) are more prevalent in females than males.

Visual impairments are related to sex in such a complex way that no firm conclusion can be drawn. One study reported "legal blindness" to be more common among males (Felton, et al., 1966); another indicated that "blindness" is more commonly found in women (Binocular Visual Acuity Report, 1960-62). The 1963-64 National Health Survey reported that "visual impairment" was more prevalent among females, but MRA data (1969-70) show that prevalence and incidence rates are approximately equal for males and females, both overall and for each state studied.

Demographic studies of the schizophrenic population have produced conflicting evidence. A 1969 study by Taube and Rednick (1973), for example, found that female rates of new additions exceeded male rates in the middle age groups (25 to 44 and 45 to 64), whereas male rates exceeded female rates in all other age groups. These same investigators, in a study of patient care episodes, found the overall rate about equal for both sexes. While other studies (e.g., Bremer, 1951; Helgason, 1964) have reported overall higher rates for females, Taube (1973) found a preponderance of schizophrenia among males. Dohrenwend and Dohrenwend (1969) report no significant differences according to sex.

The age distribution of men and women in the general population is essentially the same. Within the handicapped population, however, handicapped women tend to be older than handicapped men. Sixty-four percent of handicapped women are between 45 and 64 years old; 58 percent of handicapped men are between 45 and 64 (President's

Committee on Employment of the Handicapped, 1975).

Ethnicity

The U.S. Bureau of the Census (1973) has reported that work disability rates differ only slightly among the three predominant ethnic groups in the U.S. They estimated that 10.4% of whites suffer work disability. The parallel figures for Mexican-Americans and blacks are 11.2% and 14.5%, respectively. Allan and Cinsky (1972) reported that disability is disproportionately common among blacks.

As can be seen Table 3-3, minority groups are generally harder hit by the various disabling conditions than is the white or Anglo majority. Our findings show that only emphysema, cerebral palsy, and hearing impairment occur more frequently among whites. Slightly more whites than blacks suffer from cancer of the colon/rectum, but differences between the two groups are not statistically significant (Levin, *et al.*, 1974). This disability--along with coronary heart disease, kidney disorders, and rheumatoid arthritis--shows no strong racial predilections.

Socioeconomic Status and/or Education

The President's Committee on Employment of the Handicapped (1975) found that among the very lowest socioeconomic group, the proportion handicapped is almost twice as high as the proportion in the general population. Fifteen percent of the poor are handicapped compared with 8% of the general population. In another report, the Committee (1974) reported that handicapped people also tend to be less well educated. Twenty-two percent of handicapped persons had not completed the 8th grade, compared to 14% of the general population. Only 5% of the handicapped population had completed four years of college, compared to 9% of the general population.

Seven of the fourteen case study disabilities were found to be more prevalent among lower socioeconomic groups. In our analysis, spinal cord injury, stroke, and arthritis showed no trends according to socioeconomic status or level of education. For the remaining disabilities (cancer, cerebral palsy, and kidney disease), existing information was not sufficient to warrant conclusions concerning this variable. The fact that minority group status and low socioeconomic level are correlated in the U.S. makes it somewhat difficult to interpret these patterns, although it would be safest to assume that poverty is the root of many relationships between ethnicity and disability.

Urban-Rural

Of the entire disabled population, 33.9% have been found to reside in central cities, 22.6% on the urban fringe, 15.3% in other urban settings, 23.6% in rural non-farm areas, and 4.7% on the farm. The analogous figures for the total population of the United States are 32.4% residing in central cities, 27.4% in the urban fringe, 15.2% in other urban settings, 21.0% in rural non-farm areas, and 4.0% on the farm (U.S. Bureau of the Census, 1973). In summary, 75% of the total population and 71.8% of the disabled population live in urban settings. The urban-rural dimension also distinguishes the partially disabled from the completely disabled: 67.4% of the completely disabled live in urban settings, compared with 73.2% of the partially disabled (U.S. Bureau of the Census, 1973).

Most of the case study disabilities were found to affect persons living in the urban areas more frequently than they affected non-urban groups. This may be due to the high concentration of minority and lower income groups residing in our cities, the relationship between urban environmental factors such as pollution and disability, and the greater detection and diagnostic capabilities of urban service delivery systems. Only hearing impairment was found to occur more frequently in the rural population.

The pattern for the case study disabilities obviously differs from that reflected in the 1970 Census, where disabled persons were no more likely to be found in urban areas than in rural areas. Part of the problem may be differences in sampling and methodology. Most of the information reported here was based on localized studies, whereas the Census reflects patterns in all regions of the country. In both the 1966 Survey of Disabled Adults and the 1970 Census, severe disability was more prevalent in the southern states. Since the southern states not only tend to have lower socioeconomic levels and higher proportions of nonwhites but tend to be less urbanized than many other regions of the country, any relationship between the urban-rural dimension and disability within a state or region may be obscured in the Census figures reported for the entire country. Without further investigation which includes controls on demographic variables which covary, our conclusion must be tempered.

ETIOLOGY

The following table (Table 3-4) is condensed from the etiology sections of the individual disability reports and lists the causes and risk factors associated with the various disabilities under ten etiological column headings: genetic defects, metabolic dysfunction, drugs/toxic agents, psychological factors, age, diet, disease, other/unknown, injury or trauma, and congenital. It should be noted that in several cases a particular cause of disability could fit equally well under more than one of the etiological categories. However, for simplicity's sake, they are listed under only one category. An example of this is Tay Sachs Disease, a cause of mental retardation. In the table it is listed under the "disease" heading; yet it is also a genetically carried defect.

Even with this simplification, it is apparent that the etiology of disability is complex. No case study disability has just one cause; rather, most have several causes or risk factors associated with them. Frequently the cause of disability is unknown or only hypothesized. This is hardly surprising: rehabilitation would be a concept of the past if causes of disability were known and they could be prevented.

It is important to note that some of the disabilities have etiologies of major consequence which can be prevented. Probably the clearest example is cigarette smoking, obesity, and lack of exercise as primary risk factors in coronary heart disease. Smoking also appears as a risk factor for stroke and emphysema; dietary

TABLE 3-4
ETIOLOGICAL CATEGORY

Table Format
- Disability:
  - Etiological Categories:

SPINAL CORD INJURY:
- Disease: Spinal tumors
- Injury or Trauma: 65-80%; vehicles, sports, falls, industrial accidents, knife, bomb, and gunshot wounds
- Congenital: Spina bifida; meningocele; myelomeningocele

STROKE:
- Genetic: Tendency may be inherited
- Metabolic Dysfunction: Hypercholesteremia; diabetes mellitus
- Drugs/Toxic Agents: Oral contraceptives; cigarette smoking
- Diet: Obesity
- Disease: Cerebral thrombosis (64%); cerebral embolism (17%); heart disease; hypertension; atherosclerosis
- Other/Unknown: 10%
- Injury or Trauma: Compression; spasm: cerebral hemorrhage
- Congenital: Congenital defect in blood vessel; congenital aneurysms

CEREBRAL PALSY:
- Genetic: Familial athetosis; congenital tremors; spastic paraplegia; atonic diplegias; familial rigidity
- Drugs/Toxic Agents: Blood type incompatibility (Rh); toxemia
- Disease: Tuberous sclerosis; demyelinating diseases; maternal infections; kernicterus; meningitis; encephalitis; tay sach's disease
- Injury or Trauma: Anoxia (pre-perinatal); cerebral hemorrhage; gonadal irradiation due to X-ray; prematurity; prolonged labor; abnormal birth; sudden pressure change (i.e., ceasarian)

EPILEPSY:
- Genetic: Inherited
- Metabolic Dysfunction: Hypoglycemia; hypocalcemia; vitamin B6 deficiency; acute intermittent porphyria; phenylketonuria
- Drugs/Toxic Agents: Intoxication - convulsant drugs, lead, sudden withdrawal by chronic alcoholics, overdoses of stimulants and depressants; maternal German measles; toxemia
- Disease: Brain tumors; cerebral infections - encephalitis; meningitis; febrile convulsions; trichinosis; sturge-weber

TABLE 3-4 (CONTINUED)
ETIOLOGICAL CATEGORY

syndrome; Alzheimer's disease; toxoplasms; cytomegalic includion disease; Tay Sach's disease; Vascular disease

Other/Unknown: Improper implantation or premature separation of the placenta may interfere with fetal blood supply and cause brain damage

Injury or Trauma: Head injuries; subdural hematoma; anoxia

Congenital: Congenital syphillis

MENTAL RETARDATION:

- Genetic: Chromosomal abnormalities; (Down's Syndrome: Klinefelter's Syndrome)
- Metabolic Dysfunction: Phenylketonuria; galactosema; cretinism; Hurler's disease; Wilson's disease; maternal diabetes
- Drugs/Toxic Agents: Rh incompatibility; intoxication - lead, arsenic, carbon monoxide
- Psychological: Extreme maternal anxiety
- Age: Down's Syndrome more likely as maternal age increases
- Diet: Maternal malnutrition during pregnancy
- Disease: Maternal infections (rubella); tuberous sclerosis; neurofibromatosis; brain tumors; meningitis; encephalitis; Heller's disease; Tay Sach's disease
- Other/Unknown: Cultural-social deprivation (all known organic causes account for approximately 5% of the incidence of retardation; cultural-social or unknown causes account for 95%)
- Injury or Trauma: Premature birth; low birth weight; perinatal anoxia; brain injuries due to accident or trauma
- Congenital: Congenital syphillis; congenital abnormalities of skull and brain - microcephalv; hydrocephaly; macrocephaly; hyperterlorism; craniostenosis; anencephaly; agyria

SCHIZOPHRENIA:

- Genetic: (Hypotehsized) genetic predisposition; inherited defect in an enzyme which oxidizes adrenaline
- Metabolic Dysfunction: (Hypothesized) errors in neuramic acid and tryptophane metabolism; chemical factors in carbohydrate metabolism; defects in neural transmitters such as serotonin, adrenaline, acetylcholine
- Drugs/Toxic Agents: (Hypothesized) toxicity of body fluids
- Psychological: (Hypothesized) stress; emotional disorder; "double blind" (acceptance and rejection); irrationality; anxiety; social isolation
- Diet: (Hypothesized) poor nutrition before, during and after birth
- Other/Unknown: (Hypothesized) probably a combination of genetic pre-disposition and environmental factors; defect in neural synapses; attentional deficit
- Congential: (Hypothesized) defective embryogenesis

TABLE 3-4 (CONTINUED)
ETIOLOGICAL CATEOGRY

RHEUMATOID ARTHRITIS:
Genetic: Inherited
Metabolic Dysfunction: Auto-immune systems altered; more common in females (ratio 3:1 or 3:2)
Psychological: More common in neurotic personality types (hypochondria, depression, hysteria) may be precipitated by abrupt emotional upheaval
Age: Incidence increases with age most common between 30-50 years old
Disease: Infecting agents; malignancy (R.A. thought by some to be a malignancy): Still's disease
Injury or Trauma: May be caused by manual labor occupations (Farmers, auto workers, etc.)

CORONARY HEART DISEASE:
Genetic: Inherited CHD (both sexes)
Metabolic Dysfunction: Elevated serum lipids (especially cholesterol): males more prone than females - female incidence approaches male incidence after menopause, diabetes mellitus
Drug/Toxic Agents: Cigarette smoking (#1 risk factor)
Psychological: Stress
Age: Incidence of CHD increases with age
Diet: Obesity; diets high in sugar and animal fat
Disease: Hypertension
Other/Unknown: Lack of exercise

EMPHSEMA:
Genetic: Deficiency in serum alpha-antitypsin
Drugs/Toxic Agents: Cigarette smoking (#1 risk factor); air pollution)
Disease: Respiratory infections

COLON/RECTUM CANCER:
Genetic: Inherited diseases (see Diseases)
Age: Incidence increases with age
Diet: #1 risk factor - low fiber and highly refined carbohydrates
Disease: Gardner's syndrome; familial polyposes; ulcerative colitis; villous adenoma; Crohn's Disease; globulin deficiency

KIDNEY DISEASES:
Nephritis:
Genetric: Partially sex-linked
Drugs/Toxic Agents: Allergy to drugs(Phenindione and sulphonamides) and analgesics (phenacetin)
Nehprosis:
Drugs/Toxic Agents: Reactions to drugs and allergens

TABLE 3-4 (CONTINUED)
ETIOLOGICAL CATEGORY

- Nephrotic Syndrome:
  - Metabolic Dysfunction: Diffuse and nodular diabetic glomerulesclerosis, amyloidosis, myxedema
  - Disease: Systemic diseases; primary renal parenchymal disease; glomerular disease
  - Other/Unknown: Foreign bodies such as renal calculi and catheters
  - Injury or Trauma: Urinary tract obstruction including pregnancy and prostate enlargement; renal artery obstruction
  - Congenital: Congenital urinary tract obstruction; congenital renal dysplasias
- Pyelonephritis:
  - Metabolic Dysfunction: Diabetes mellitus
  - Disease: Microorganisms entering kidney through bloodstream or urinary tract; nephrocarcinosis; polycystic disease; ischalmic disease of the kidney; nephrosclerosis; intercapillary glomerulosclerosis; systemic disorders of host resistance; hypoplasia
- Glomerulonephritis:
  - Disease: Streptococceal infection; usually preceeded by an upper respiratory hercolytic streptococcal infection
- Other Kidney and Urinary Disorders:
  - Genetic: Cystic kidney diseases - hereditary defects; cyctinuria - 2 forms, mendelian recessive and incompletely recessive; secondary hypertension - amyloidosis; renal carcinoma - hereditary
  - Metabolic Dysfunction: Kidney stones - primary hyperparathyroidism - excess parathormone mobilizes skeletal calcium; urinary tract stones - may be associated with metabolic diseases; cystic kideny diseases - inborn errors of metabolism allow the accumulation of a nephrotoxic substance which produces secondary renal damage; secondary hypertension - endocrine mechanisms; polycystic kidneys; renal carcinoma - influence of sex hormones
  - Drugs/Toxic Agents: Secondary hypertension - toxemia of pregnancy; benign neoplasm - ingestion of dye substances; uremia drug intoxication (espeically barbituates)
  - Disease: Kidney stones - urinary tract infections; urinary renal tuberculosis - arises from an infection of the lungs of hilar lymph nodes; cystinuria - infections; secondary hypertension - glomerulonephritis; pyelonephritis, renal ischemia; periateritis nodosa; renal carcinoma - infectious agents; benign neoplasm - parasitism; renal infarction - atheroma; emoblism; chronic renal failure - disease of the glomeruli and vasculature

TABLE 3-4 (CONTINUED)
ETIOLOGICAL CATEGORY

Other/Unknown: Kidney stones - dehydration; cystinuria - malformations in renal tract structure and inadequate fluid intake; secondary hypertension - renal artery obstruction; neurogenic mechanisms; acute renal failure - asphyxia; dehydration; poor renal perfusion; due to hypovalemia; gastro-intestional upset

Injury or Trauma: Renal carcinoma - physical agents; uremia - injury; hyoptension during anesthesia; severe burns causing fluid shift; renal infraction - blocked arterial blood supply; arterial injury or spasm; acute renal failure - injury

Congenital: Congenital anomalies of size, number, development, location; renal carcinoma - embryonal cells trapped in kidney; chronic renal failure - developmental anomalies; acute renal failure - congenital lesions

DIABETES MELLITUS:

Metabolic Dysfunction: Under 40 years of age, more common in men - in 50's and 60's (age) more common in women; growth hormone - higher levels in diabetes

Age: Incidence increases with age

Diet: Obesity

Disease: Viral infection

HEARING IMPAIRMENT:

Genetic: 33%

Drugs/Toxic Agents: Prenatal toxemia; prenatal - maternal rubella

Age: Presbycusis

Disease: Scarlet fever; infections; meningitis; chronic otitis; tympanosclerosis; kernicterus

Other/Unknown: 33%

Injury to Trauma: Premature birth; noise induced; prenatal anoxia

VISUAL IMPAIRMENT:

Metabolic Dysfunction: Diabetes; albinism

Disease: Arteriosclerosis; hypertension; nephritis; retinal degeneration; senile cataracts (15.6%); glaucoma (13.5%)

Congenital: Cataracts; prenatal coloboma; congenital glaucoma factors appear to underlie not only heart disease, but stroke, colon/rectum cancer, diabetes, schizophrenia, and mental retardation. Poor nutrition and smoking both cause low birth weight, which is associated with mental retardation. Another example of a preventable disability is genetic defect underlying mental retardation, particularly Down's Syndrome (mongolism). It is known that the incidence of Down's Syndrome increases as maternal age at birth of the child increases. The chances are much greater for a woman of forty-five to have a child with Down's Syndrome than for a woman of twenty-five. Also, several genetic and congenital defects leading to mental retardation and other disabilities can be detected early in pregnancy by amniocentesis. This leads to the possibility of aborting fetuses known to be severely defective. However, this method of reducing the incidence of disability conflicts with the values of many people and thus may not be effective. Finally, evidence from the Milwaukee Project and elsewhere suggests that nonorganic or cultural-familial mental retardation can be prevented through intensive early childhood education and environmental change.

Spinal cord injury is another major disability which could be drastically reduced in incidence since 65% - 80% of such cases are caused by injuries and accidents. Of course, the discovery of cures for diseases which underlie disability would significantly alter the scope of the problem of disability in the future. The major point being made through the examples mentioned here is that the incidence of several disabilities can be reduced now, without innovations in medical technology. Although the focus of the present technology assessment is rehabilitation of those persons who are disabled, the state of the art in prevention is worthy of assessment in its own right.

LIFE FUNCTIONS

The primary objectives of this section are: (1) to characterize the types of impairments which may affect disabled persons in a set of Life Function Need Trees; (2) to extract major Need Constellations from the classification trees in order to characterize needs which are most frequently reported in the literature within and across disability groups; and (3) to identify commonalities which link various groups to one another. It is hoped that the classification trees will serve as a conceptual aid in further analysis of the problems of the disabled, now and in the future, and that the analysis of numbers of entries in various need constellations will aid in understanding the major difficulties presently faced by persons with the fourteen disabilities considered in the study.

A set of caveats concerning the data is in order:

1. The basic unit of analysis was specific statements of impairments or need extracted from the published literature pertaining to each disability group, but there was no way to standardize such statements such that they all pertained to the same level of analysis and abstractness. The original hope in conducting the analysis was that difficulties in daily activities could be described in detail. However, the published literature is not focused on such problems to any great extent. In the medical literature, disease entities are named and described but their

implications for daily functioning are rarely assessed. One is made aware of etiological factors, symptoms, and the locus of organic involvement, but there is a definite lack of descriptions of functional impairments. A person with arthritis, for example, may be described as having inflamed joints in the hand. At another level of analysis, this person has limitations in finger dexterity and strength. Statements of both types often occurred in the literature, but rarely does the literature go beyond these levels of analysis. For an arthritic person interviewed in conjunction with the study, the problem was pushing in the button to open her car door and opening jars. In some cases, need statements did refer to activities of daily life, but in most cases one must consider life function need statements as abstractions with many potential implications for daily activities. Not only do need statements vary in level of analysis (i.e., impairments vs. disability vs. handicap), but they range from the highly concrete to the highly abstract.

2. The fact that a need statement has been entered for a group says nothing about the proportion of persons in the group experiencing the need or the duration of the need. Although some need statements in the literature specified percentages affected, most did not, particularly those derived from the medical literature on chronic diseases, and therefore it was difficult to note the dynamics of many need statements. As a result, only the roughest estimates of numbers affected can be made and the fact of diversity within disability groups must constantly be borne in mind.

researcher took primary responsibility for devising a preliminary classification tree. The tree was then reviewed by another team member so that branches could be further refined and consensus could be reached on statements which were difficult to classify. Each tree is arranged in multiple levels of abstractness, branching all the way to specific statements of need which appear in the literature. Although the trees might have been formulated differently by different minds, they are offered here as an aid in conceptualizing the types of problems which the disabled experience.

After the trees had been constructed, levels within the trees were designated as Need Constellations for analytic purposes. In the Life Function Need Trees, each Need Constellation has been marked for easy identification and reference with an asterisk. The Need Constellation levels were judged to be specific enough to pinpoint a major area of need but general enough to offer a means of simplifying the complexity represented in the classification trees.

Tables 3-5 through 3-9 provide counts of the numbers of need statements reported for each disability group in each of the need constellations within each of the five life functions. These tables indicate the needs of specific disability groups and can be used (bearing in mind caveats) in comparing disability groups. A major observation which can be made on the basis of these tables is that a disability group is rarely limited in only one or two areas within a life function. Instead, if a group has needs in a life function, they tend to be diverse.

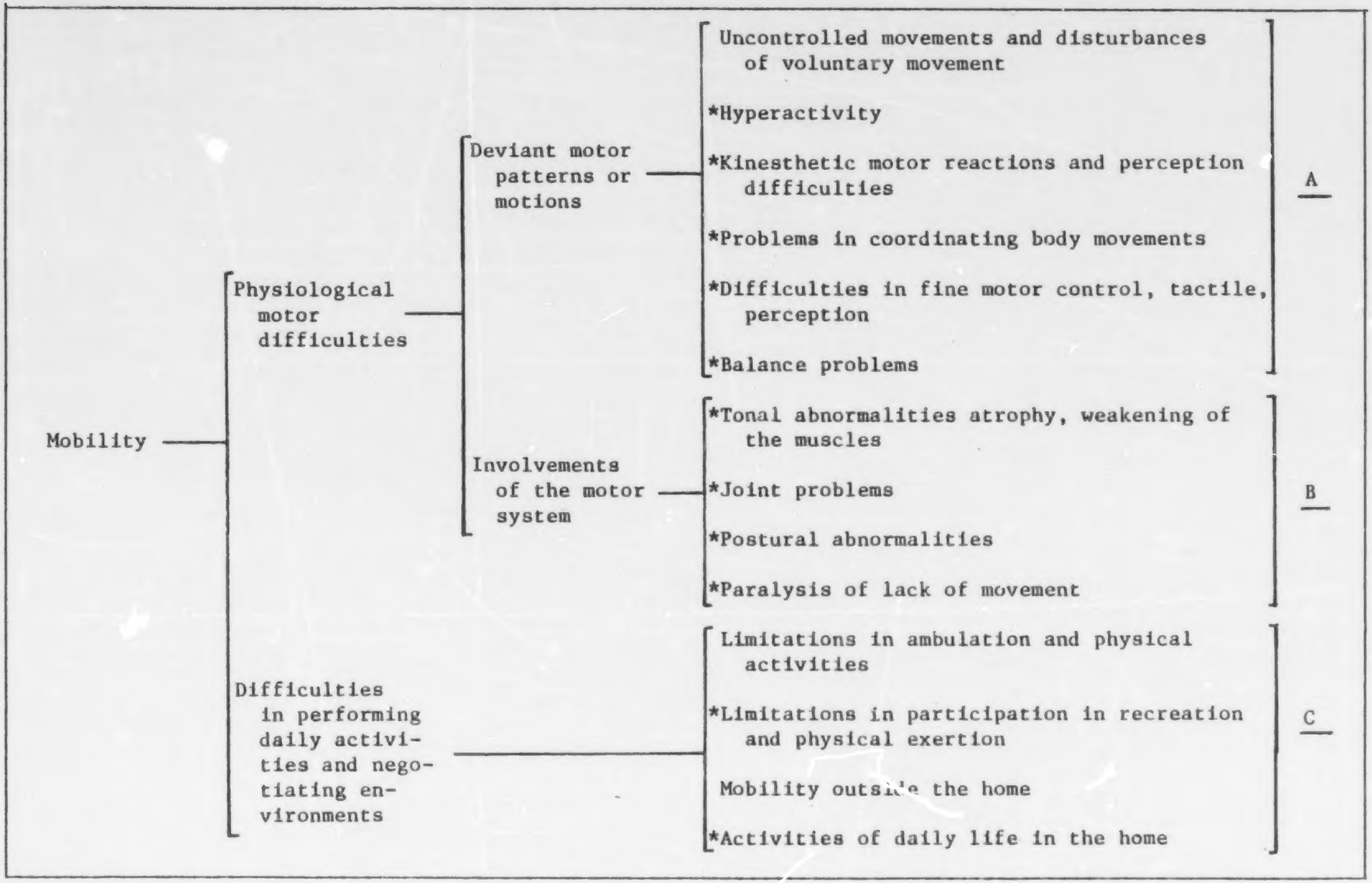

Mobility
Physiological motor difficulties
Deviant motor patterns or motions
Uncontrolled movements and disturbances of voluntary movement
*Hyperactivity
*Kinesthetic motor reactions and perception difficulties
*Problems in coordinating body movements
*Difficulties in fine motor control, tactile, perception
*Balance problems
A
Involvements of the motor system
*Tonal abnormalities atrophy, weakening of the muscles
*Joint problems
*Postural abnormalities
*Paralysis of lack of movement
B
Difficulties in performing daily activities and negotiating environments
Limitations in ambulation and physical activities
*Limitations in participation in recreation and physical exertion
Mobility outside the home
*Activities of daily life in the home
C

Figure 3-4. Tree diagram for mobility needs.

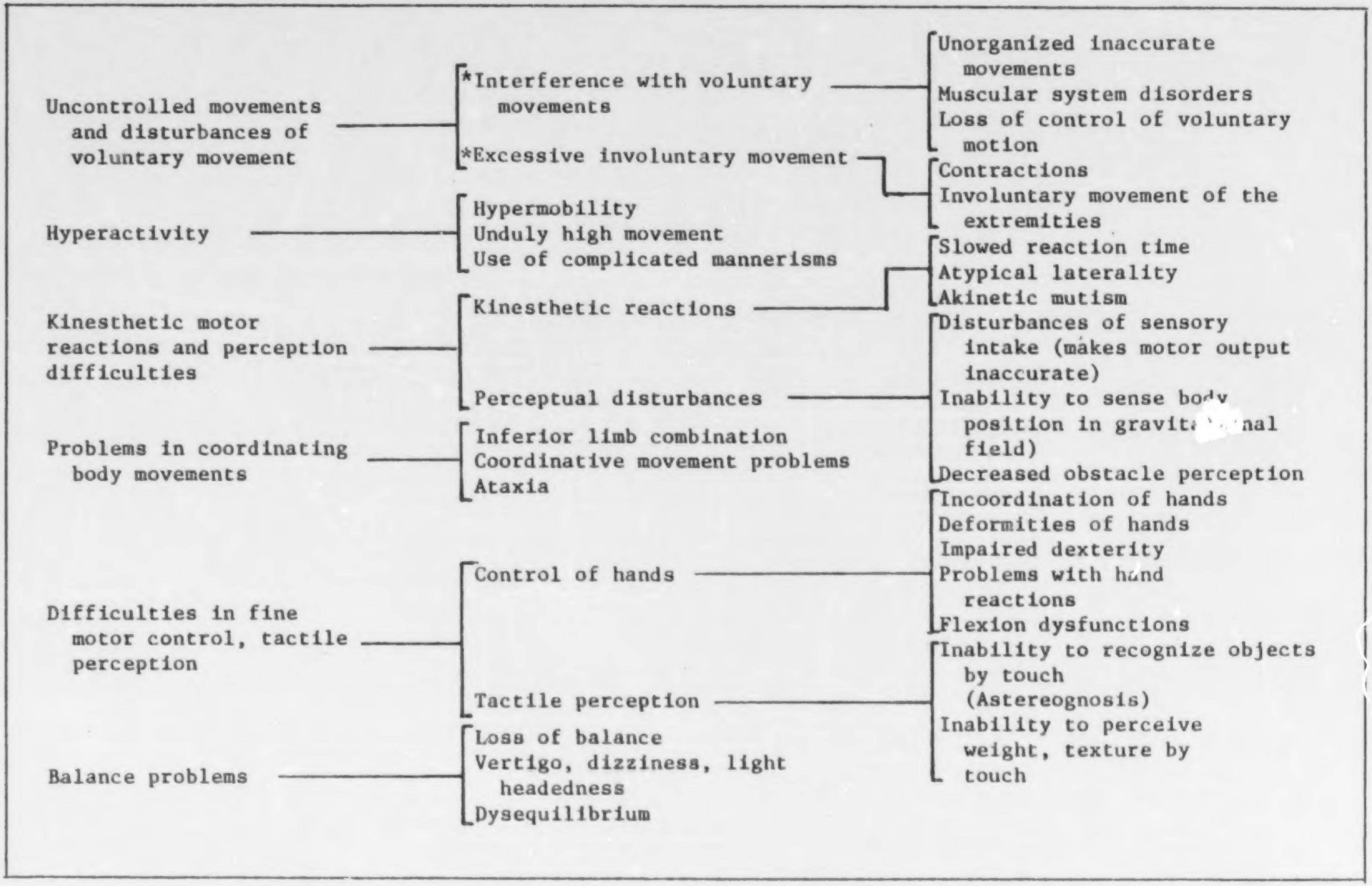

Uncontrolled movements and disturbances of voluntary movement
*Interference with voluntary movements
Unorganized inaccurate movements
Muscular system disorders
Loss of control of voluntary motion
*Excessive involuntary movement
Contractions
Involuntary movement of the extremities
Hyperactivity
Hypermobility
Unduly high movement
Use of complicated mannerisms
Slowed reaction time
Atypical laterality
Akinetic mutism
Kinesthetic motor reactions and perception difficulties
Kinesthetic reactions
Perceptual disturbances
Disturbances of sensory intake (makes motor output inaccurate)
Inability to sense body position in gravitational field)
Decreased obstacle perception
Problems in coordinating body movements
Inferior limb combination
Coordinative movement problems
Ataxia
Difficulties in fine motor control, tactile perception
Control of hands
Incoordination of hands
Deformities of hands
Impaired dexterity
Problems with hand reactions
Flexion dysfunctions
Tactile perception
Inability to recognize objects by touch (Astereognosis)
Inability to perceive weight, texture by touch
Balance problems
Loss of balance
Vertigo, dizziness, light headedness
Dysequilibrium

Figure 3-4 (continued-A). Tree diagram for mobility needs.

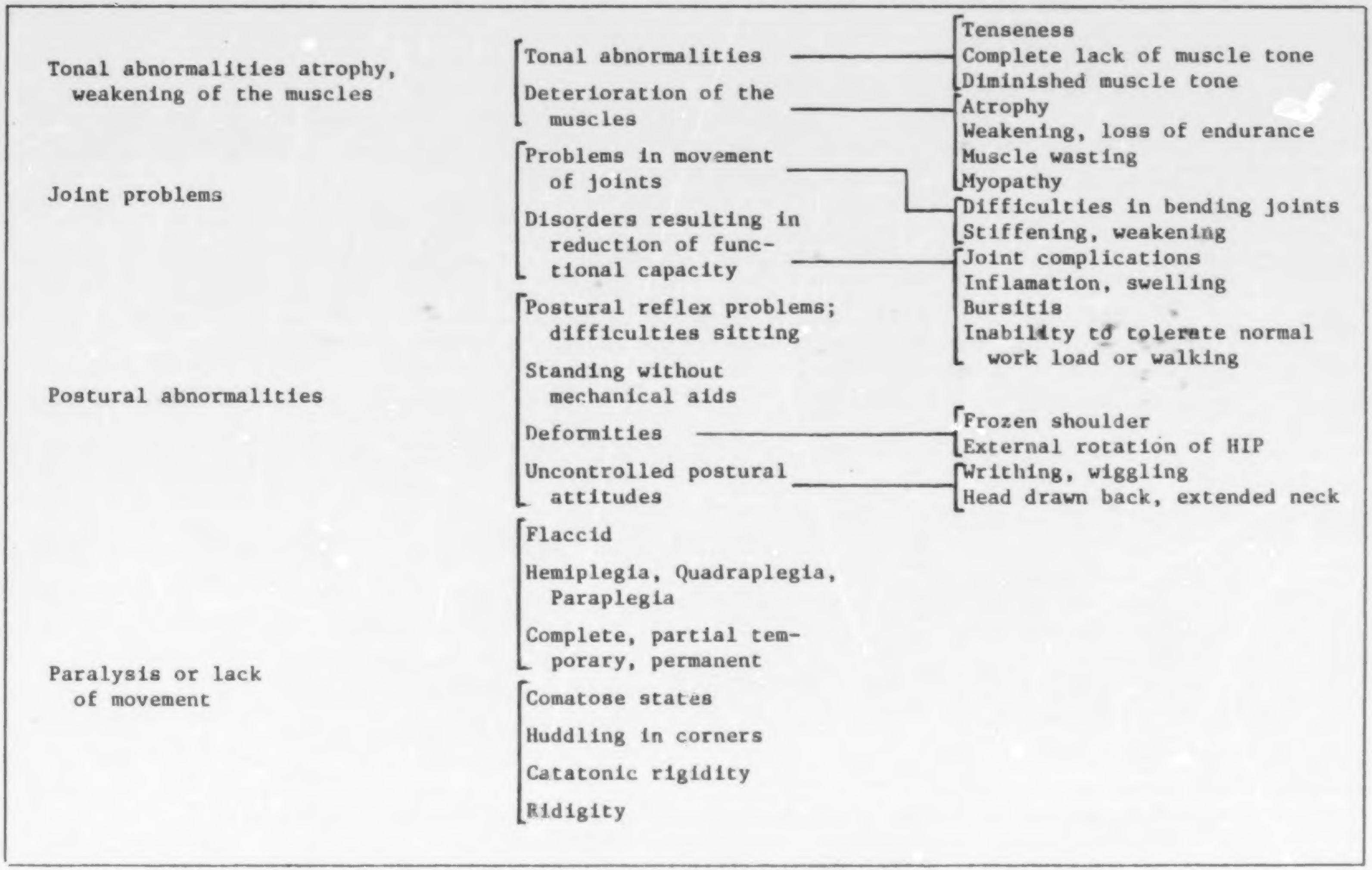

Tonal abnormalities atrophy, weakening of the muscles
Tonal abnormalities
Tenseness
Complete lack of muscle tone
Diminished muscle tone
Deterioration of the muscles
Atrophy
Weakening, loss of endurance
Muscle wasting
Myopathy
Joint problems
Problems in movement of joints
Difficulties in bending joints
Stiffening, weakening
Disorders resulting in reduction of functional capacity
Joint complications
Inflamation, swelling
Bursitis
Inability to tolerate normal work load or walking
Postural abnormalities
Postural reflex problems; difficulties sitting
Standing without mechanical aids
Deformities
Frozen shoulder
External rotation of HIP
Uncontrolled postural attitudes
Writhing, wiggling
Head drawn back, extended neck
Paralysis or lack of movement
Flaccid
Hemiplegia, Quadraplegia, Paraplegia
Complete, partial temporary, permanent
Comatose states
Huddling in corners
Catatonic rigidity
Ridigity

Figure 3-4 (continued-B). Tree diagram for mobility needs.

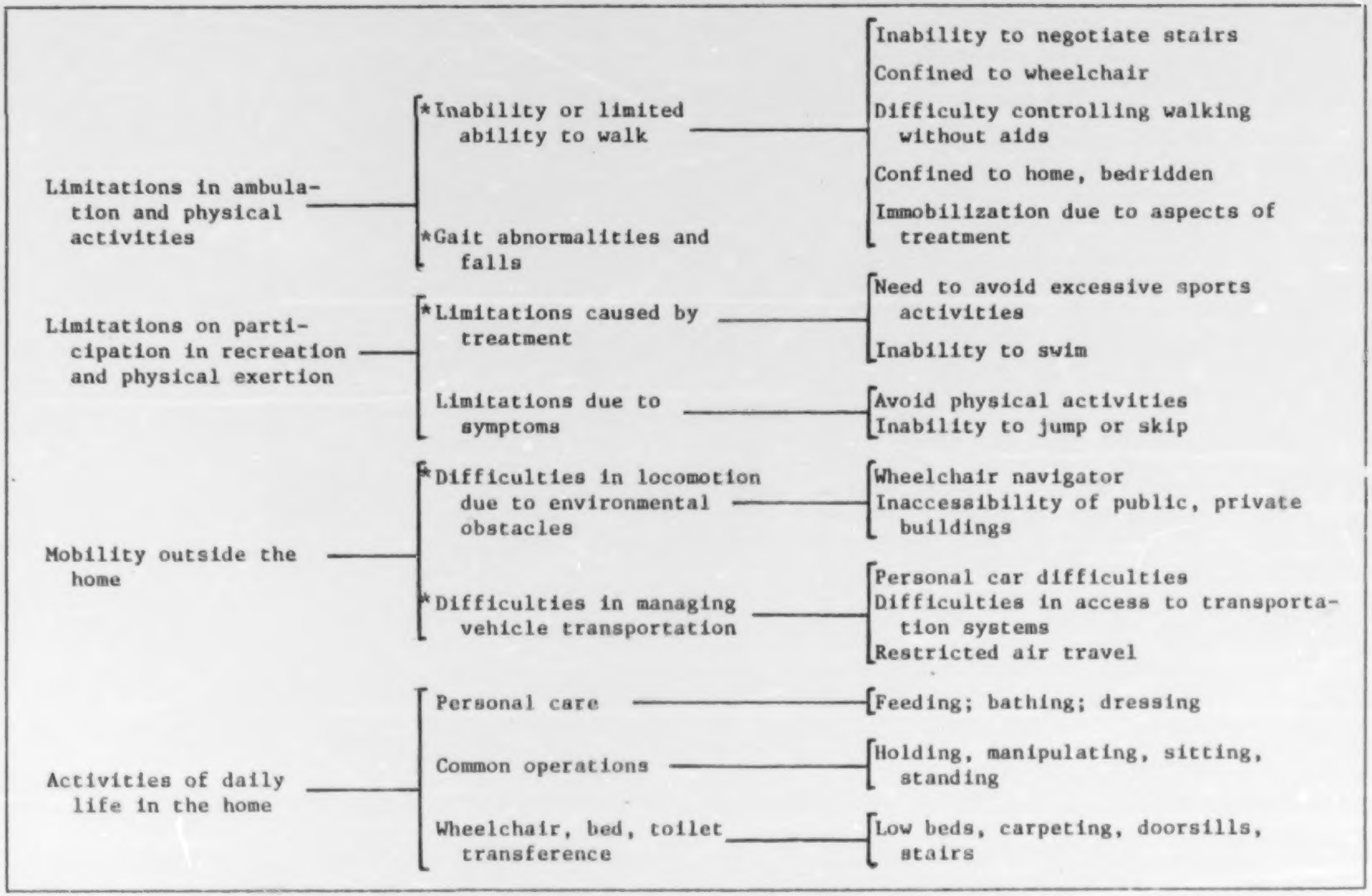

Limitations in ambulation and physical activities
*Inability or limited ability to walk
Inability to negotiate stairs
Confined to wheelchair
Difficulty controlling walking without aids
Confined to home, bedridden
Immobilization due to aspects of treatment
*Gait abnormalities and falls
Limitations on participation in recreation and physical exertion
*Limitations caused by treatment
Need to avoid excessive sports activities
Inability to swim
Limitations due to symptoms
Avoid physical activities
Inability to jump or skip
Mobility outside the home
*Difficulties in locomotion due to environmental obstacles
Wheelchair navigator
Inaccessibility of public, private buildings
*Difficulties in managing vehicle transportation
Personal car difficulties
Difficulties in access to transportation systems
Restricted air travel
Activities of daily life in the home
Personal care
Feeding; bathing; dressing
Common operations
Holding, manipulating, sitting, standing
Wheelchair, bed, toilet transference
Low beds, carpeting, doorsills, stairs

Figure 3-4 (continued-C). Tree diagram for mobility needs.

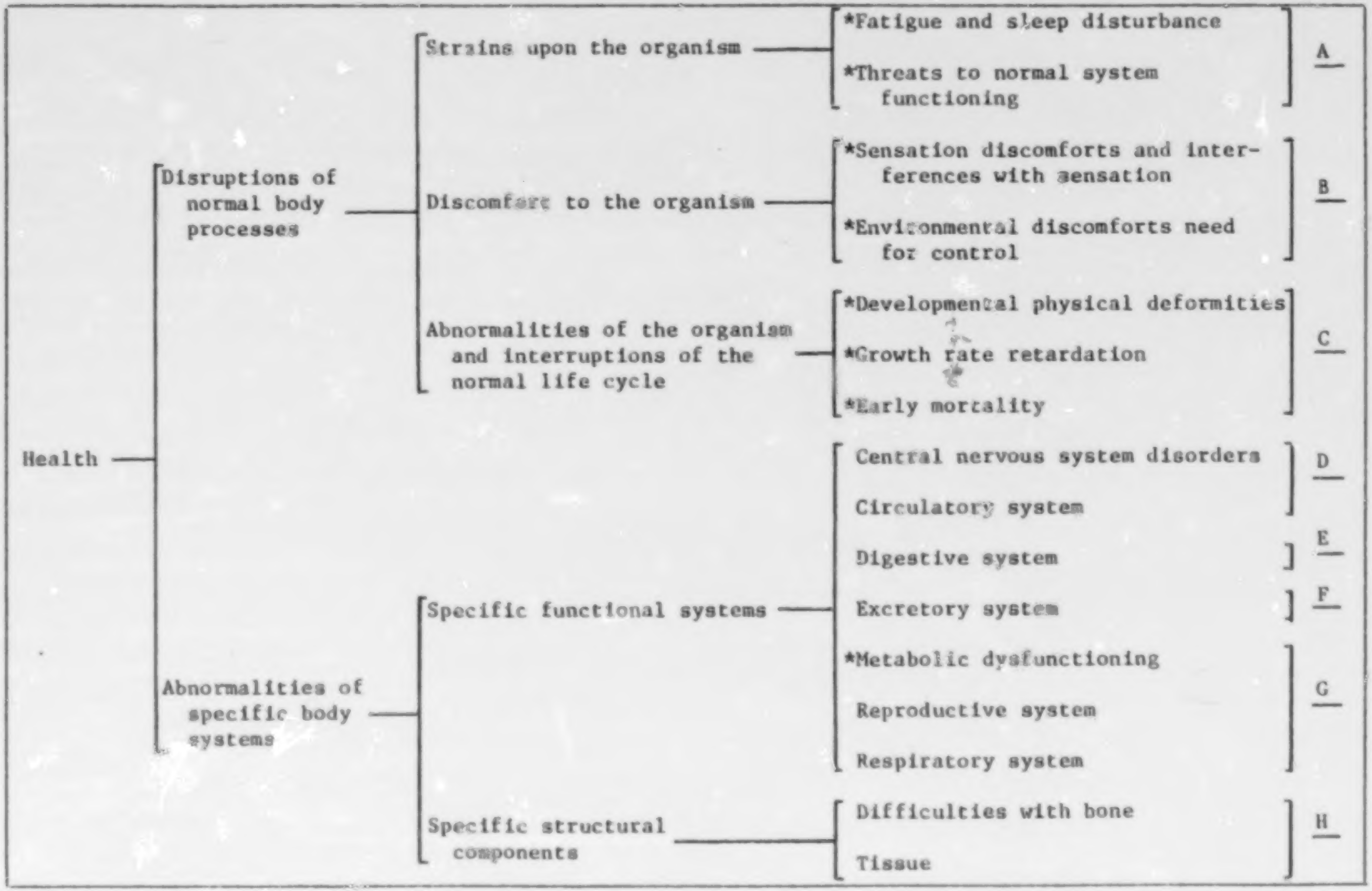

Health
Disruptions of normal body processes
Strains upon the organism
*Fatigue and sleep disturbance
*Threats to normal system functioning
A
Discomfort to the organism
*Sensation discomforts and interferences with sensation
*Environmental discomforts need for control
B
Abnormalities of the organism and interruptions of the normal life cycle
*Developmental physical deformities
*Growth rate retardation
*Early mortality
C
Abnormalities of specific body systems
Specific functional systems
Central nervous system disorders
Circulatory system
D
Digestive system
E
Excretory system
F
*Metabolic dysfunctioning
Reproductive system
Respiratory system
G
Specific structural components
Difficulties with bone
Tissue
H

Figure 3-5. Tree diagram for health needs.

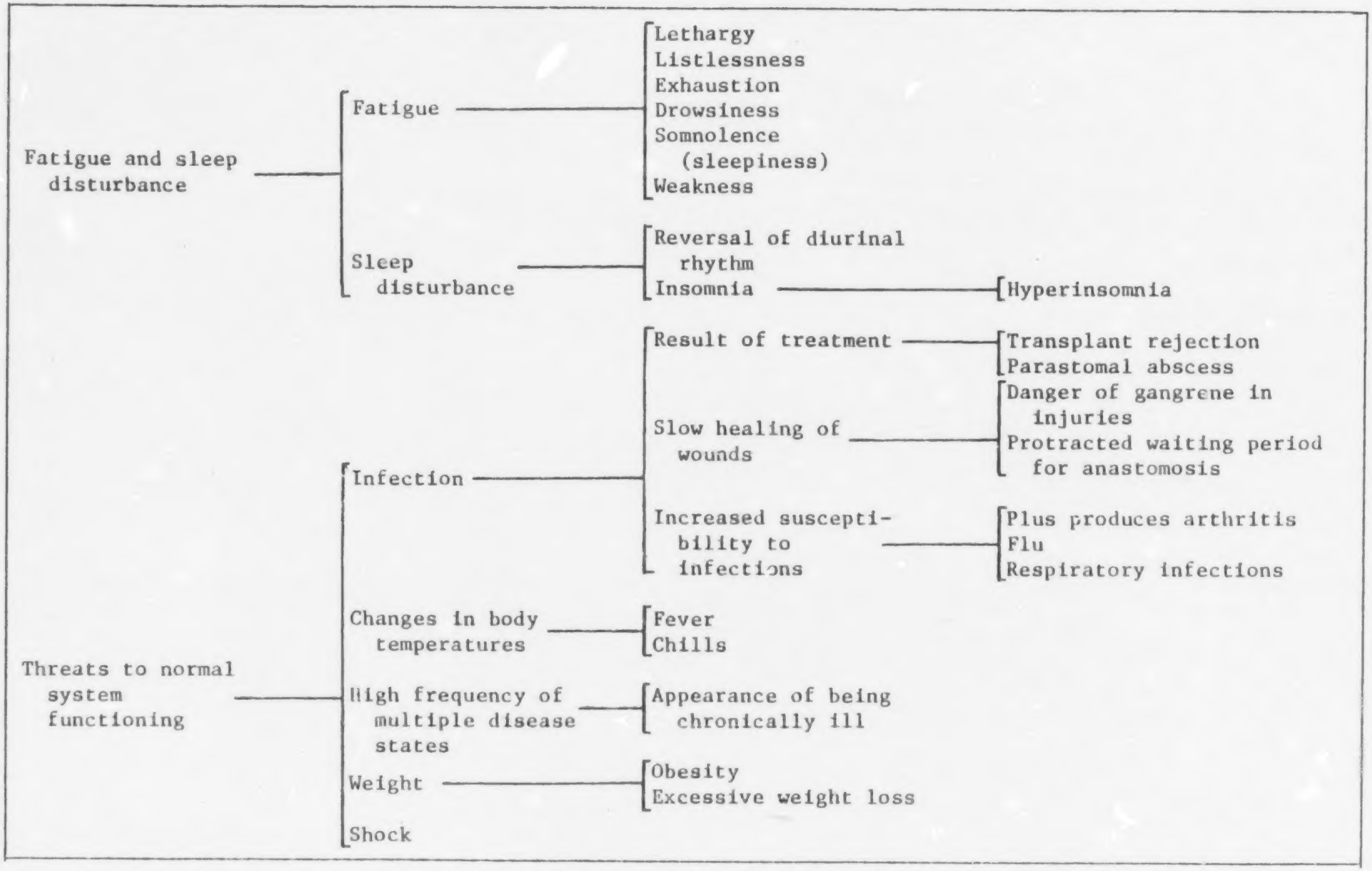

Fatigue and sleep disturbance
Fatigue
Lethargy
Listlessness
Exhaustion
Drowsiness
Somnolence (sleepiness)
Weakness
Sleep disturbance
Reversal of diurinal rhythm
Insomnia
Hyperinsomnia
Threats to normal system functioning
Infection
Result of treatment
Transplant rejection
Parastomal abscess
Slow healing of wounds
Danger of gangrene in injuries
Protracted waiting period for anastomosis
Increased suscepti-bility to infections
Plus produces arthritis
Flu
Respiratory infections
Changes in body temperatures
Fever
Chills
High frequency of multiple disease states
Appearance of being chronically ill
Weight
Obesity
Excessive weight loss
Shock

Figure 3-5 (continued-A). Tree diagram for health needs.

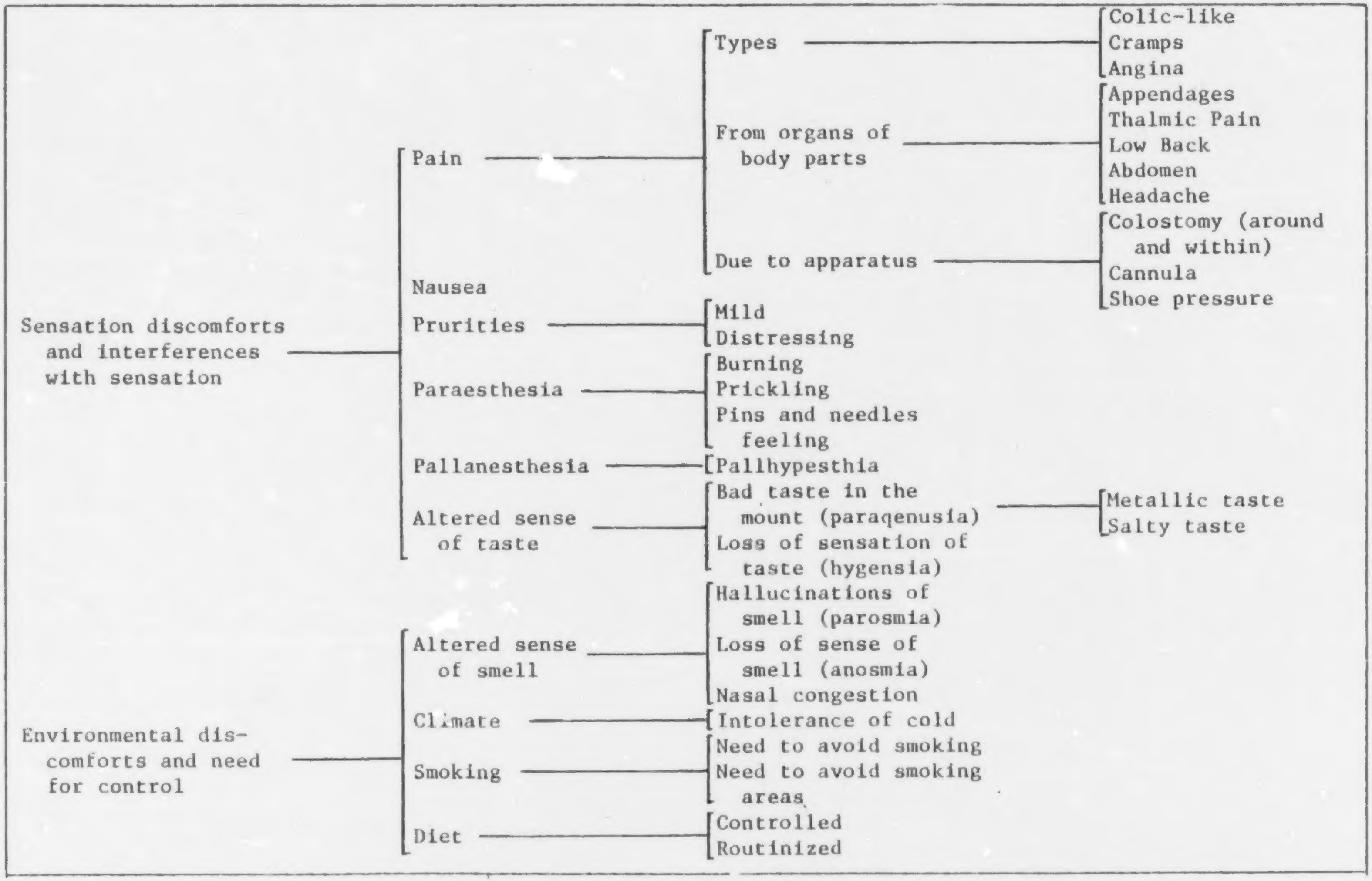

Sensation discomforts and interferences with sensation
Pain
Types
Colic-like
Cramps
Angina
From organs of body parts
Appendages
Thalmic Pain
Low Back
Abdomen
Headache
Due to apparatus
Colostomy (around and within)
Cannula
Shoe pressure
Nausea
Pruritics
Mild
Distressing
Paraesthesia
Burning
Prickling
Pins and needles feeling
Pallanesthesia
Pallhypesthia
Altered sense of taste
Bad taste in the mount (paraqenusia)
Metallic taste
Salty taste
Loss of sensation of taste (hygensia)
Environmental discomforts and need for control
Altered sense of smell
Hallucinations of smell (parosmia)
Loss of sense of smell (anosmia)
Nasal congestion
Climate
Intolerance of cold
Smoking
Need to avoid smoking
Need to avoid smoking areas
Diet
Controlled
Routinized

Figure 3-5 (continued-B). Tree diagram for health needs.

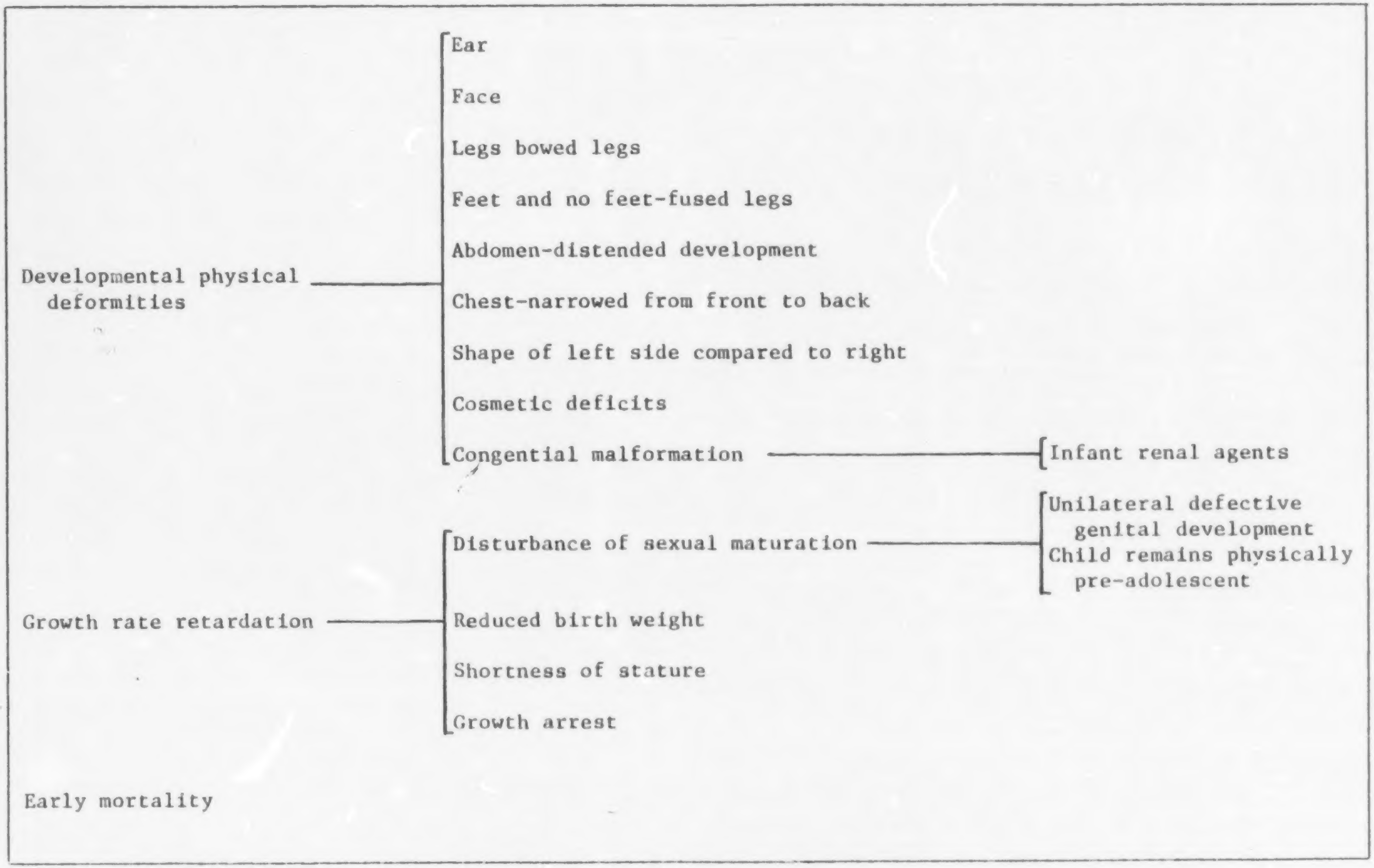

Developmental physical deformities
Ear
Face
Legs bowed legs
Feet and no feet-fused legs
Abdomen-distended development
Chest-narrowed from front to back
Shape of left side compared to right
Cosmetic deficits
Congential malformation
Infant renal agents
Growth rate retardation
Disturbance of sexual maturation
Unilateral defective genital development
Child remains physically pre-adolescent
Reduced birth weight
Shortness of stature
Growth arrest
Early mortality

Figure 3-5 (continued-C). Tree diagram for health needs.

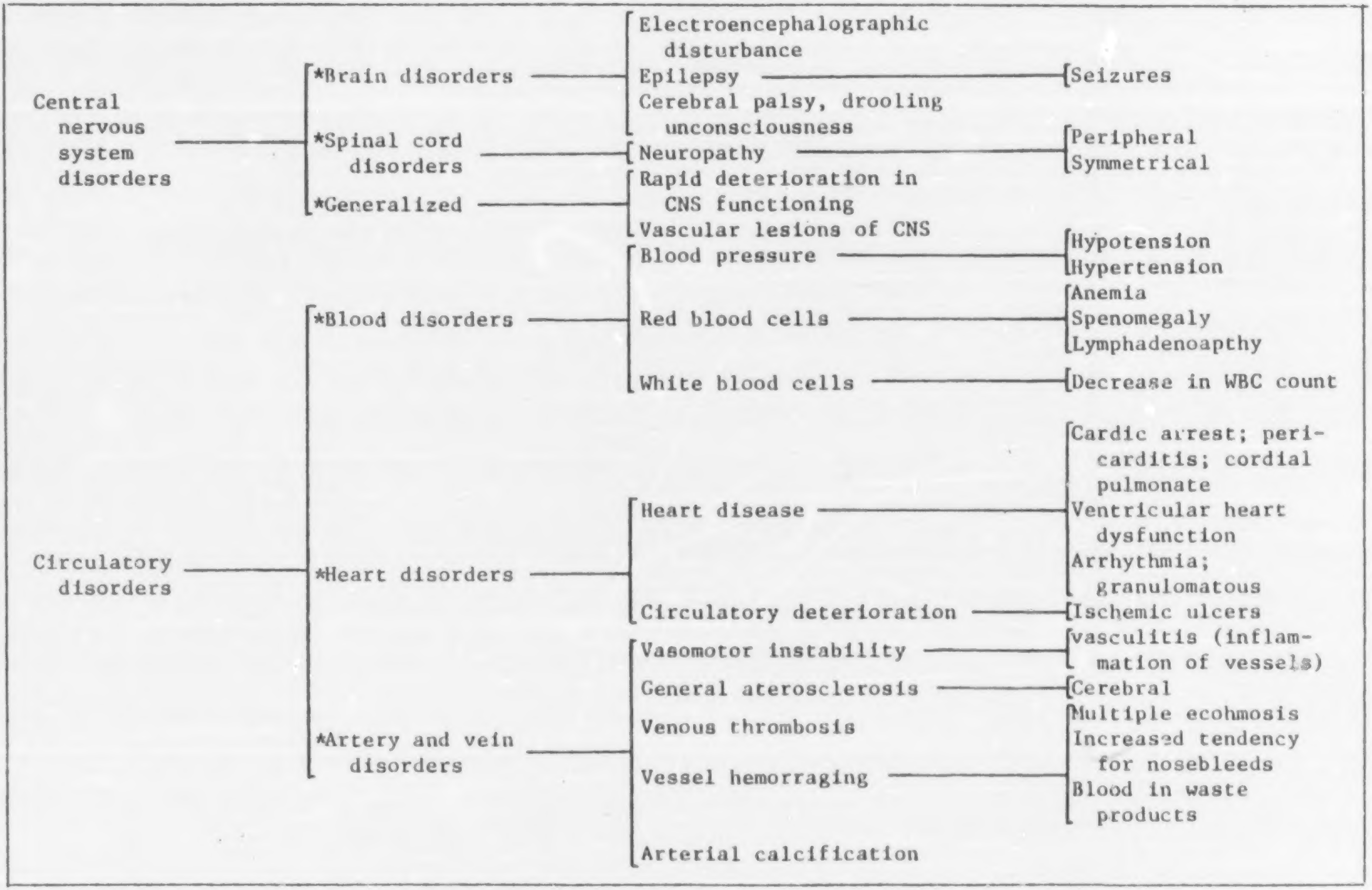

Central nervous system disorders
*Brain disorders
Electroencephalographic disturbance
Epilepsy
Seizures
Cerebral palsy, drooling unconsciousness
*Spinal cord disorders
Neuropathy
Peripheral
Symmetrical
*Generalized
Rapid deterioration in CNS functioning
Vascular lesions of CNS
Circulatory disorders
*Blood disorders
Blood pressure
Hypotension
Hypertension
Red blood cells
Anemia
Spenomegaly
Lymphadenoapthy
White blood cells
Decrease in WBC count
*Heart disorders
Heart disease
Cardic arrest; pericarditis; cordial pulmonate
Ventricular heart dysfunction
Arrhythmia; granulomatous
Circulatory deterioration
Ischemic ulcers
*Artery and vein disorders
Vasomotor instability
vasculitis (inflammation of vessels)
General aterosclerosis
Cerebral
Venous thrombosis
Multiple ecohmosis
Increased tendency for nosebleeds
Vessel hemorraging
Blood in waste products
Arterial calcification

Figure 3-5 (continued-D). Tree diagram for health needs.

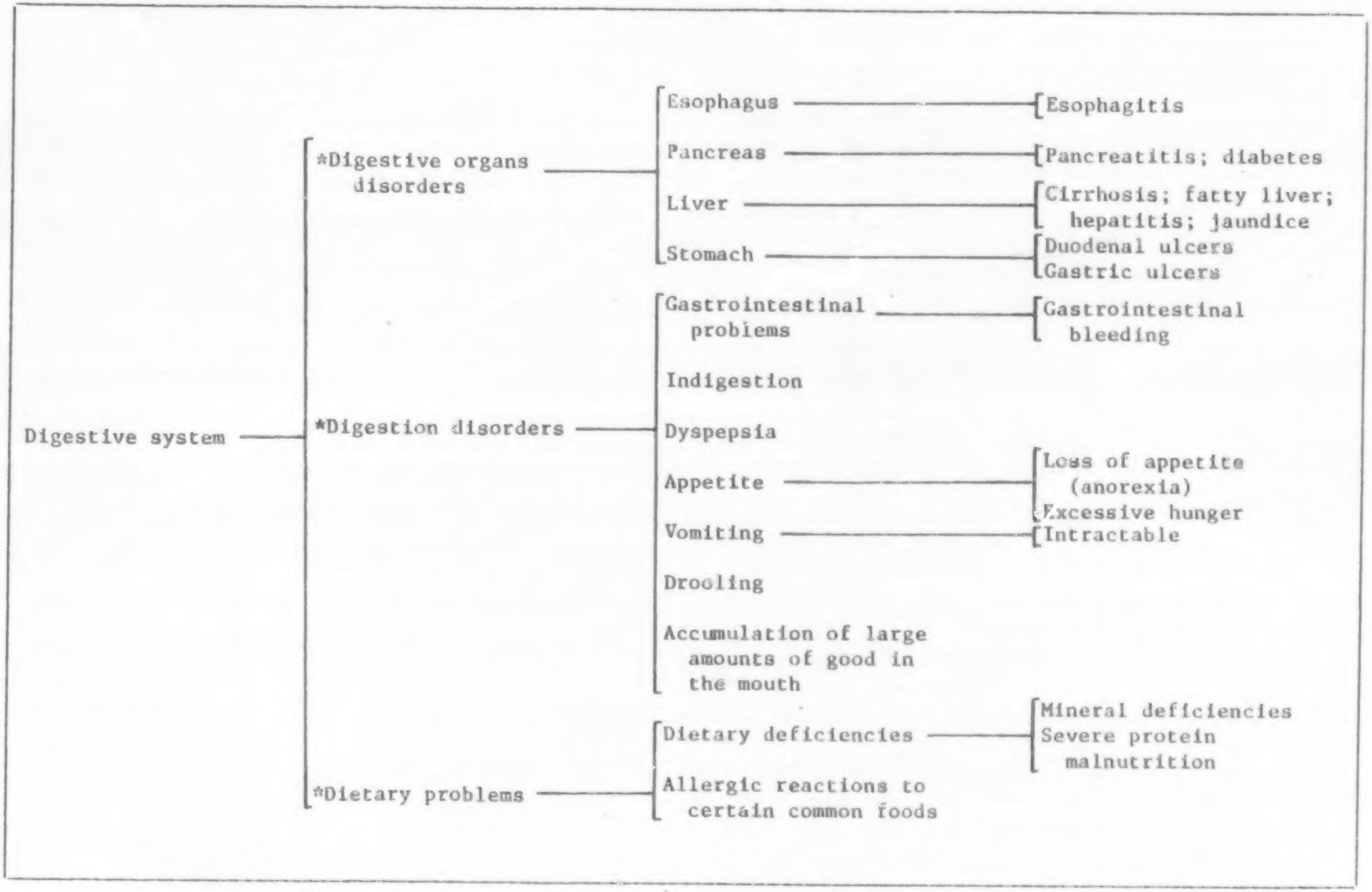

Digestive system
*Digestive organs disorders
Esophagus
Esophagitis
Pancreas
Pancreatitis; diabetes
Liver
Cirrhosis; fatty liver; hepatitis; jaundice
Stomach
Duodenal ulcers
Gastric ulcers
*Digestion disorders
Gastrointestinal problems
Gastrointestinal bleeding
Indigestion
Dyspepsia
Appetite
Loss of appetite (anorexia)
Excessive hunger
Vomiting
Intractable
Drooling
Accumulation of large amounts of good in the mouth
*Dietary problems
Dietary deficiencies
Mineral deficiencies
Severe protein malnutrition
Allergic reactions to certain common foods

Figure 3-5 (continued-E). Tree diagram for health needs.

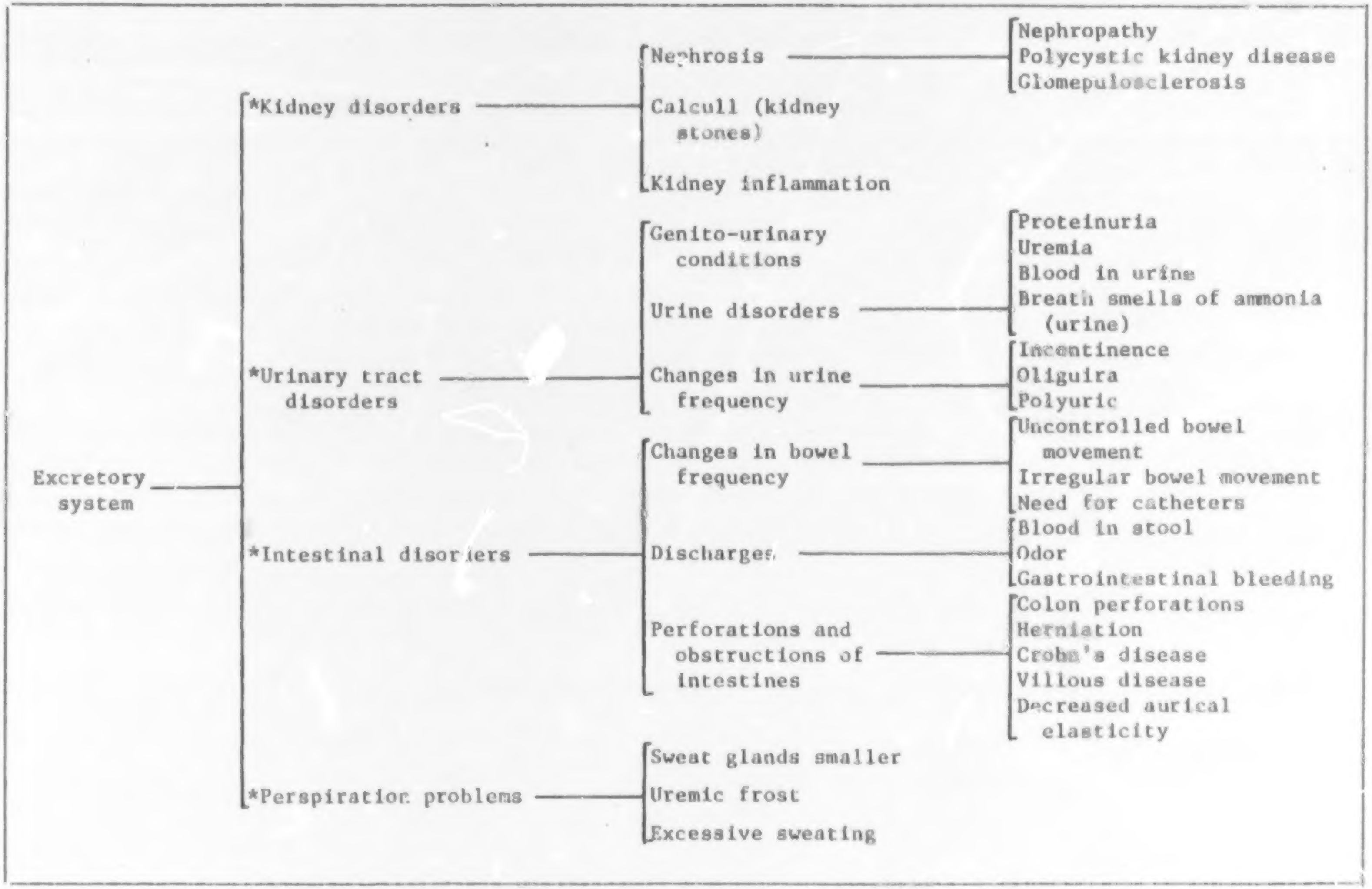
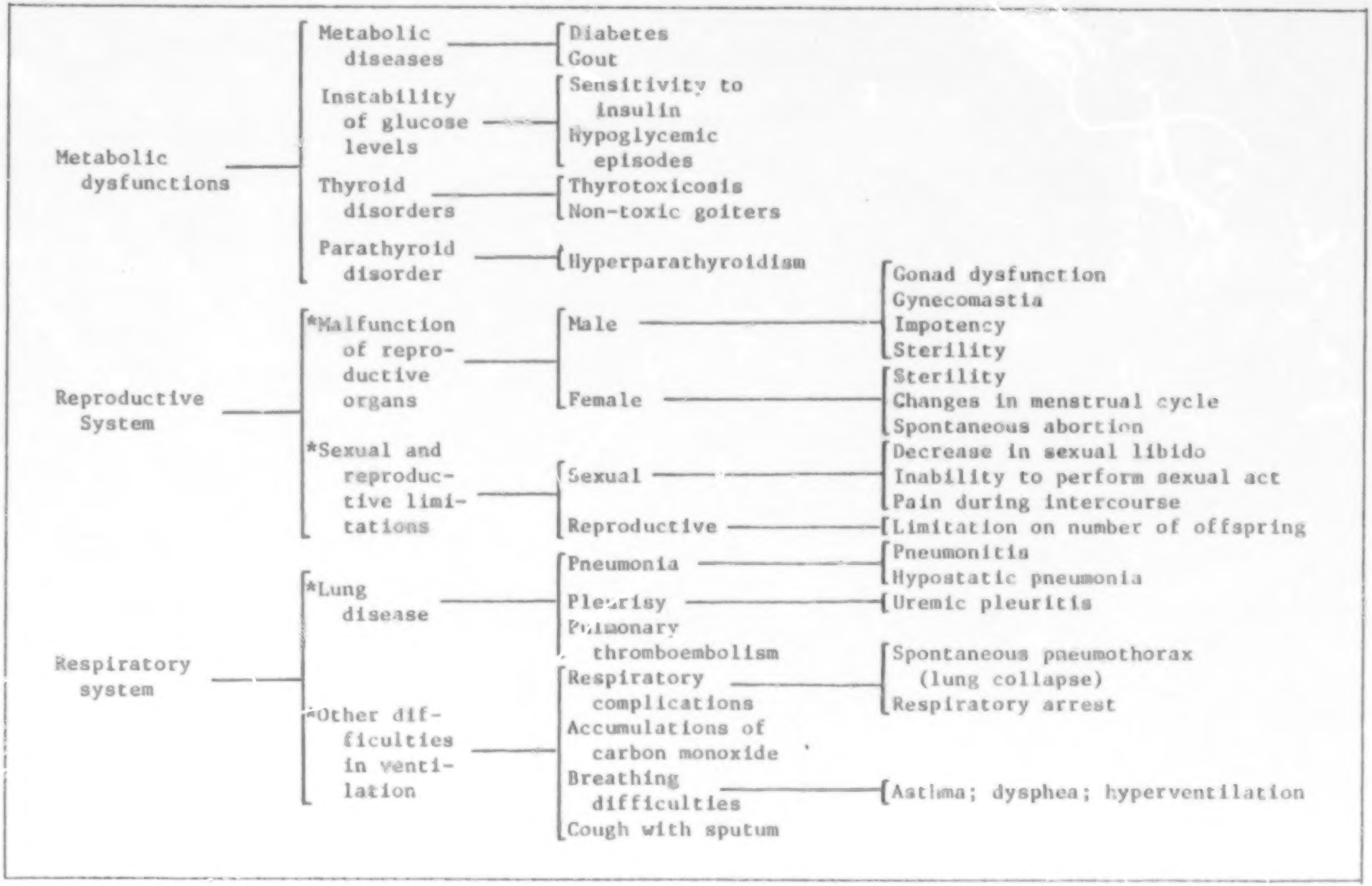

Excretory system
*Kidney disorders
Nephrosis
Nephropathy
Polycystic kidney disease
Glomepulosclerosis
Calculi (kidney stones)
Kidney inflammation
*Urinary tract disorders
Genito-urinary conditions
Urine disorders
Proteinuria
Uremia
Blood in urine
Breath smells of ammonia (urine)
Changes in urine frequency
Incontinence
Oliguira
Polyuric
*Intestinal disorders
Changes in bowel frequency
Uncontrolled bowel movement
Irregular bowel movement
Need for catheters
Discharges
Blood in stool
Odor
Gastrointestinal bleeding
Perforations and obstructions of intestines
Colon perforations
Herniation
Crohn's disease
Villous disease
Decreased aurical elasticity
*Perspiration problems
Sweat glands smaller
Uremic frost
Excessive sweating

Figure 3-5 (continued-F). Tree diagram for health needs.


Metabolic dysfunctions
Metabolic diseases
Diabetes
Gout
Instability of glucose levels
Sensitivity to insulin
Hypoglycemic episodes
Thyroid disorders
Thyrotoxicosis
Non-toxic goiters
Parathyroid disorder
Hyperparathyroidism
Reproductive System
*Malfunction of reproductive organs
Male
Gonad dysfunction
Gynecomastia
Impotency
Sterility
Female
Sterility
Changes in menstrual cycle
Spontaneous abortion
*Sexual and reproductive limitations
Sexual
Decrease in sexual libido
Inability to perform sexual act
Pain during intercourse
Reproductive
Limitation on number of offspring
Respiratory system
*Lung disease
Pneumonia
Pneumonitis
Hypostatic pneumonia
Pleurisy
Uremic pleuritis
Pulmonary thromboembolism
*Other difficulties in ventilation
Respiratory complications
Spontaneous pneumothorax (lung collapse)
Respiratory arrest
Accumulations of carbon monoxide
Breathing difficulties
Asthma; dysphea; hyperventilation
Cough with sputum

igure 3-5 (continued-G). Tree diagram for health needs.

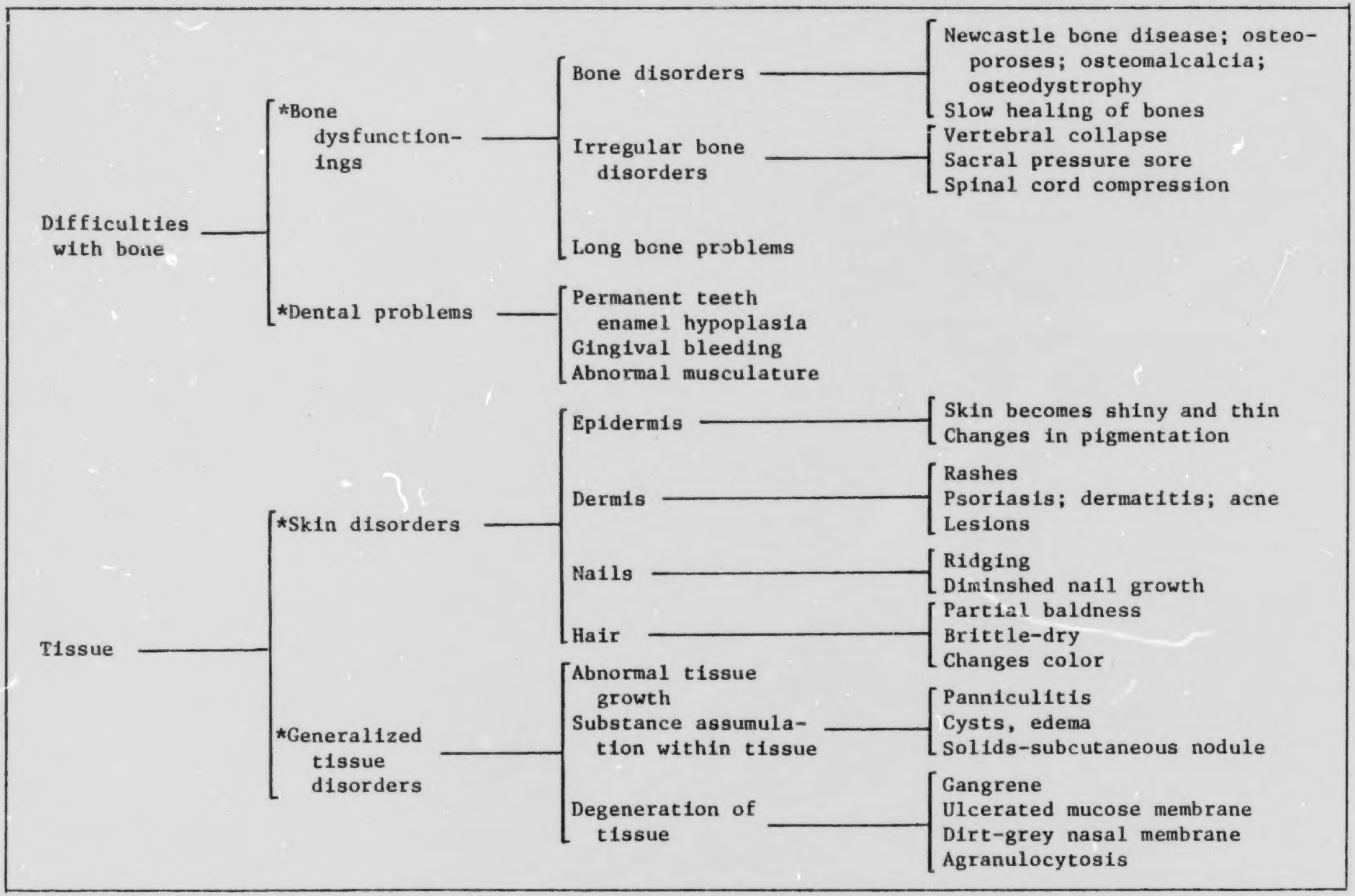

Difficulties with bone
*Bone dysfunctionings
Bone disorders
Newcastle bone disease; osteoporoses; osteomalcalcia; osteodystrophy
Slow healing of bones
Irregular bone disorders
Vertebral collapse
Sacral pressure sore
Spinal cord compression
Long bone problems
*Dental problems
Permanent teeth enamel hypoplasia
Gingival bleeding
Abnormal musculature
Tissue
*Skin disorders
Epidermis
Skin becomes shiny and thin
Changes in pigmentation
Dermis
Rashes
Psoriasis; dermatitis; acne
Lesions
Nails
Ridging
Diminshed nail growth
Hair
Partial baldness
Brittle-dry
Changes color
*Generalized tissue disorders
Abnormal tissue growth
Substance assumulation within tissue
Panniculitis
Cysts, edema
Solids-subcutaneous nodule
Degeneration of tissue
Gangrene
Ulcerated mucose membrane
Dirt-grey nasal membrane
Agranulocytosis

Figure 3-5 (continued-H). Tree diagram for health needs.

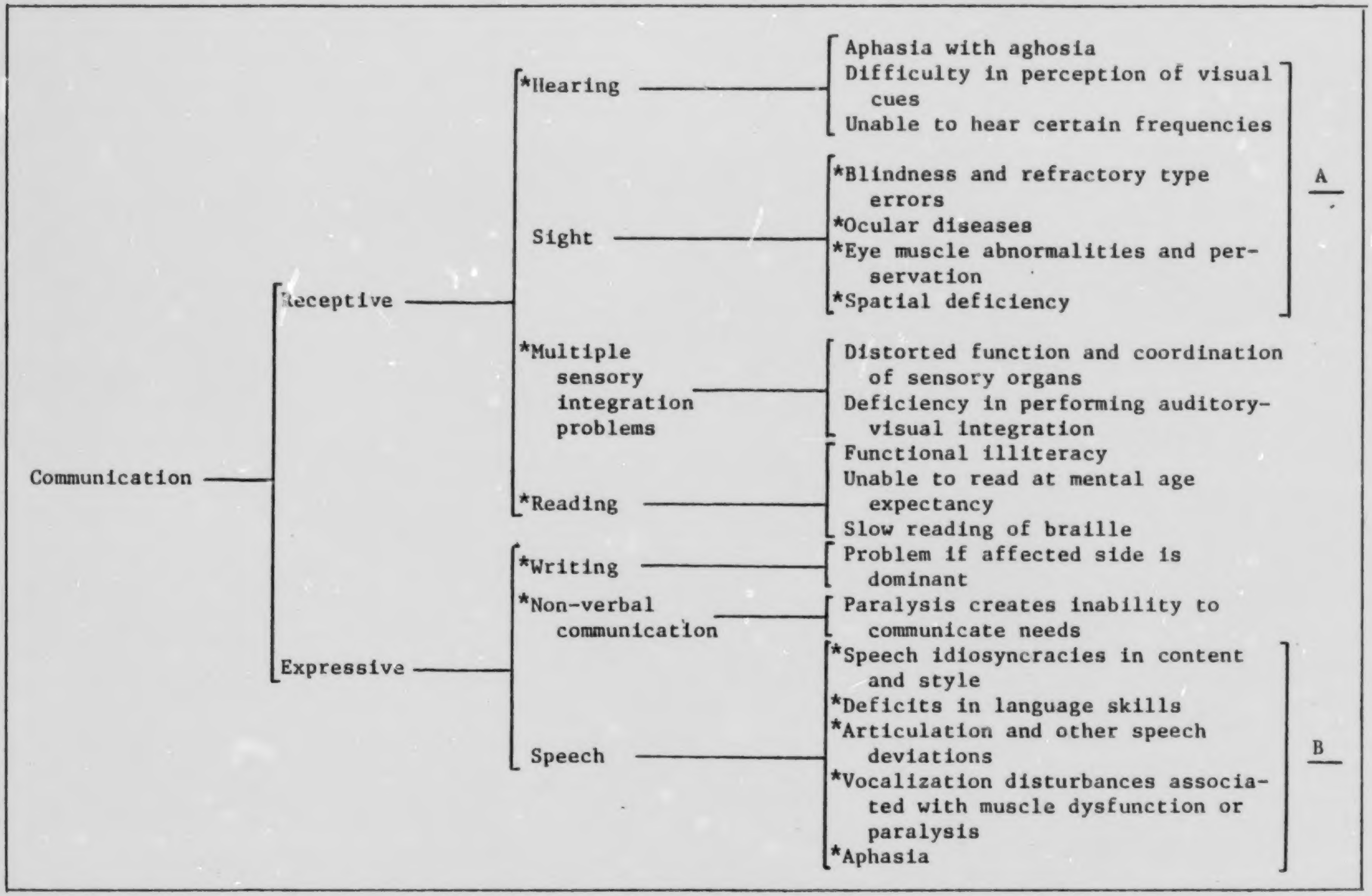

Communication
Receptive
Expressive
*Hearing
Sight
*Multiple sensory integration problems
*Reading
*Writing
*Non-verbal communication
Speech
Aphasia with aghosia
Difficulty in perception of visual cues
Unable to hear certain frequencies
*Blindness and refractory type errors
*Ocular diseases
*Eye muscle abnormalities and perservation
*Spatial deficiency
Distorted function and coordination of sensory organs
Deficiency in performing auditory-visual integration
Functional illiteracy
Unable to read at mental age expectancy
Slow reading of braille
Problem if affected side is dominant
Paralysis creates inability to communicate needs
*Speech idiosyncracies in content and style
*Deficits in language skills
*Articulation and other speech deviations
*Vocalization disturbances associated with muscle dysfunction or paralysis
*Aphasia
A
B

Figure 3-6. Tree diagram for communication needs.

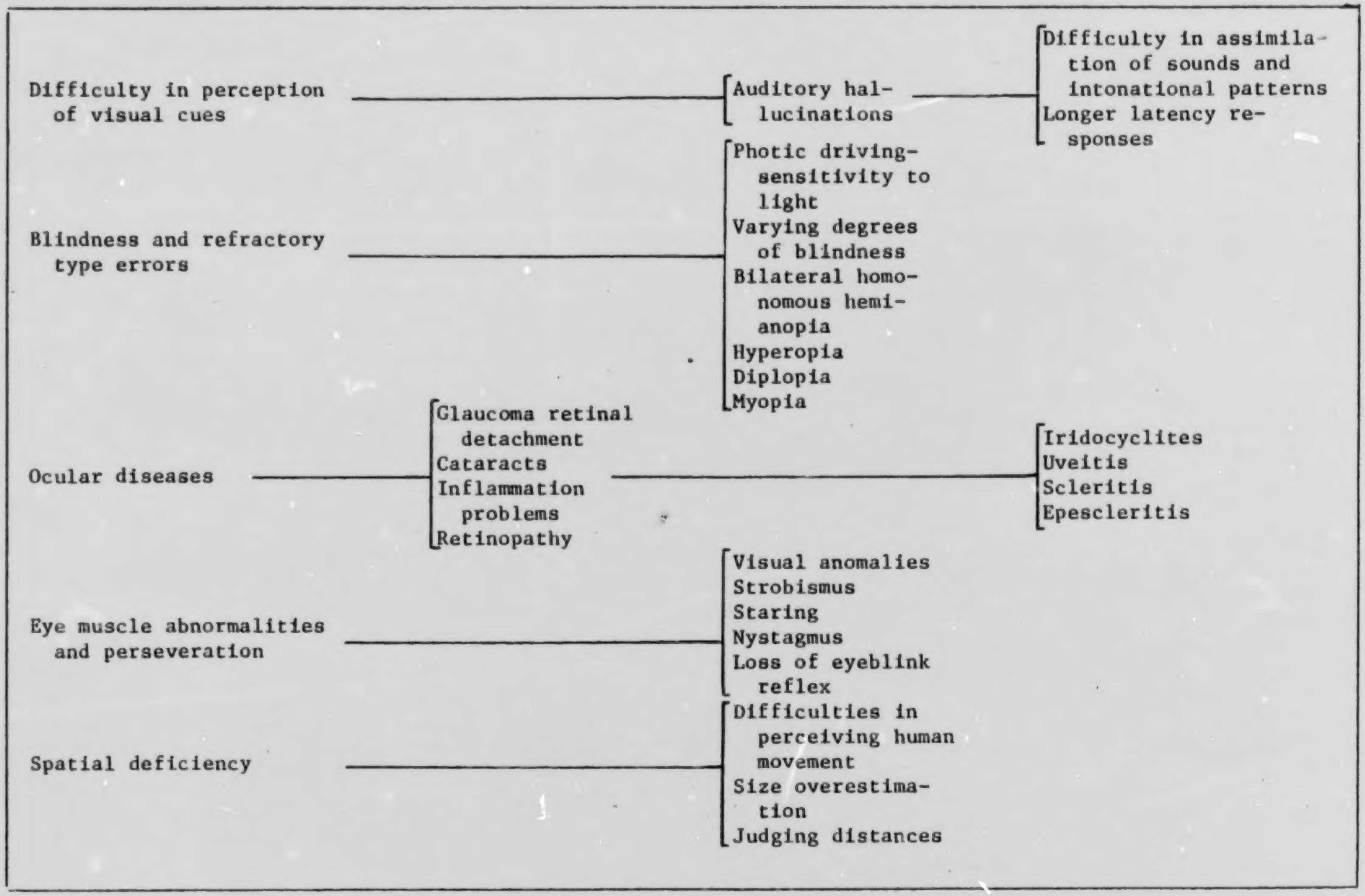

Difficulty in perception of visual cues
Auditory hallucinations
Difficulty in assimilation of sounds and intonational patterns
Longer latency responses
Blindness and refractory type errors
Photic driving-sensitivity to light
Varying degrees of blindness
Bilateral homonomous hemianopia
Hyperopia
Diplopia
Myopia
Ocular diseases
Glaucoma retinal detachment
Cataracts
Inflammation problems
Retinopathy
Iridocyclites
Uveitis
Scleritis
Epescleritis
Eye muscle abnormalities and perseveration
Visual anomalies
Strobismus
Staring
Nystagmus
Loss of eyeblink reflex
Spatial deficiency
Difficulties in perceiving human movement
Size overestimation
Judging distances

Figure 3-6 (continued-A). Tree diagram for communication needs.

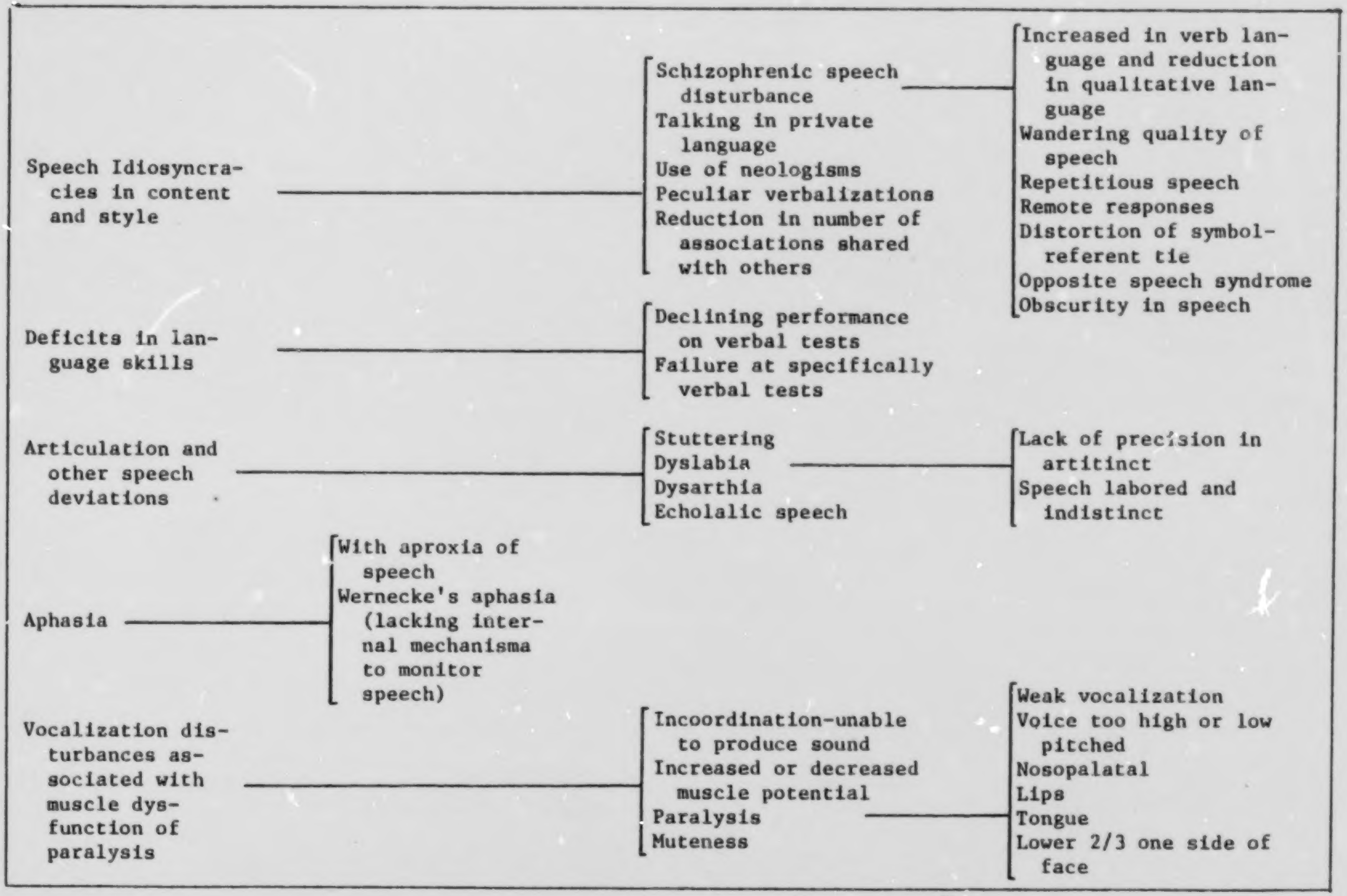

Speech Idiosyncracies in content and style
Schizophrenic speech disturbance
Talking in private language
Use of neologisms
Peculiar verbalizations
Reduction in number of associations shared with others
Increased in verb language and reduction in qualitative language
Wandering quality of speech
Repetitious speech
Remote responses
Distortion of symbol-referent tie
Opposite speech syndrome
Obscurity in speech
Deficits in language skills
Declining performance on verbal tests
Failure at specifically verbal tests
Articulation and other speech deviations
Stuttering
Dyslabia
Dysarthia
Echolalic speech
Lack of precision in artitinct
Speech labored and indistinct
Aphasia
With aproxia of speech
Wernecke's aphasia (lacking internal mechanisma to monitor speech)
Vocalization disturbances associated with muscle dysfunction of paralysis
Incoordination-unable to produce sound
Increased or decreased muscle potential
Paralysis
Muteness
Weak vocalization
Voice too high or low pitched
Nosopalatal
Lips
Tongue
Lower 2/3 one side of face

Figure 3-6 (continued-B). Tree diagram for communication needs.

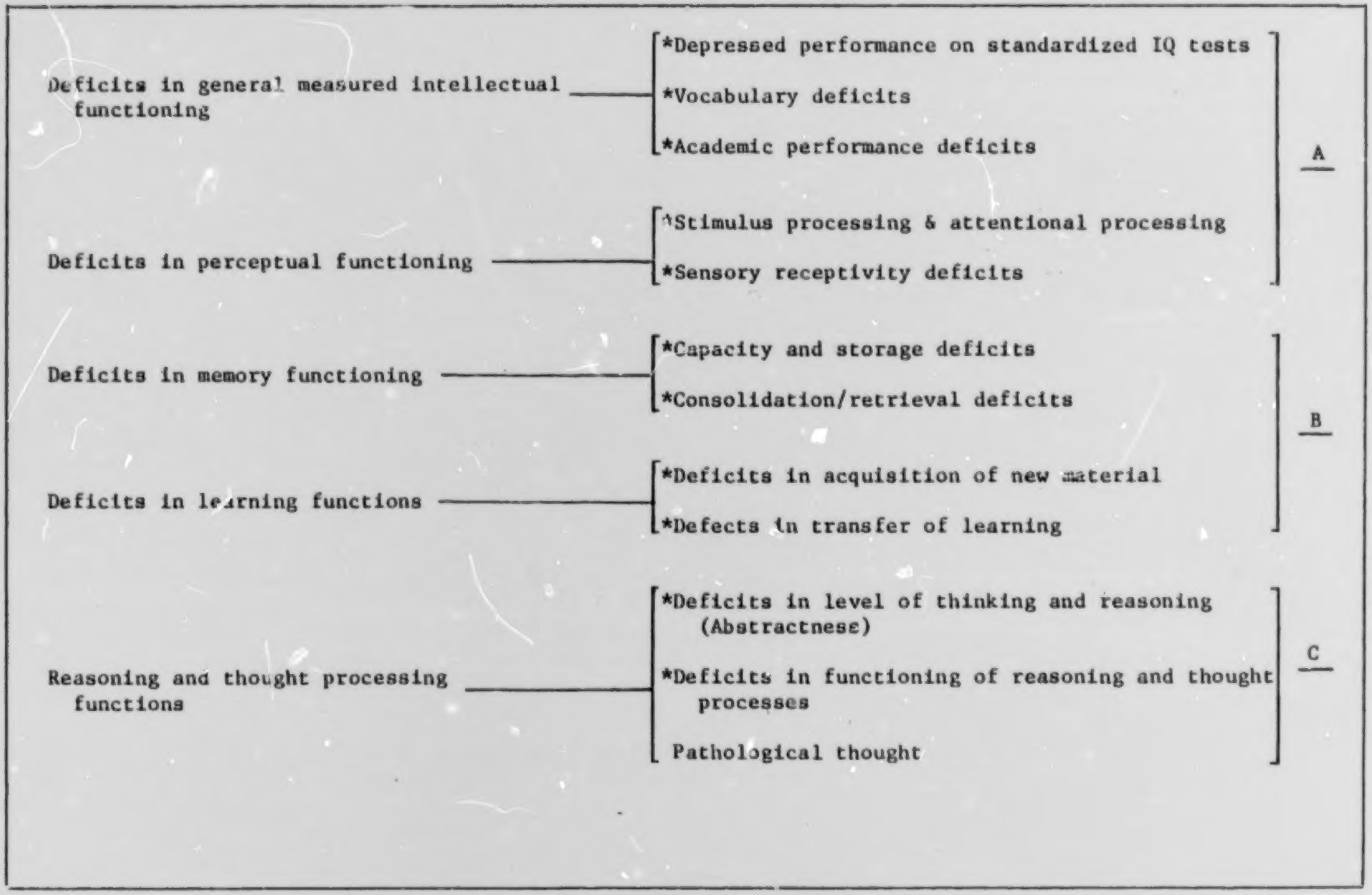

Deficits in general measured intellectual functioning
*Depressed performance on standardized IQ tests
*Vocabulary deficits
*Academic performance deficits
Deficits in perceptual functioning
*Stimulus processing & attentional processing
*Sensory receptivity deficits
A
Deficits in memory functioning
*Capacity and storage deficits
*Consolidation/retrieval deficits
Deficits in learning functions
*Deficits in acquisition of new material
*Defects in transfer of learning
B
Reasoning and thought processing functions
*Deficits in level of thinking and reasoning (Abstractness)
*Deficits in functioning of reasoning and thought processes
Pathological thought
C

Figure 3-7. Tree diagram for cognitive-intellectual needs.

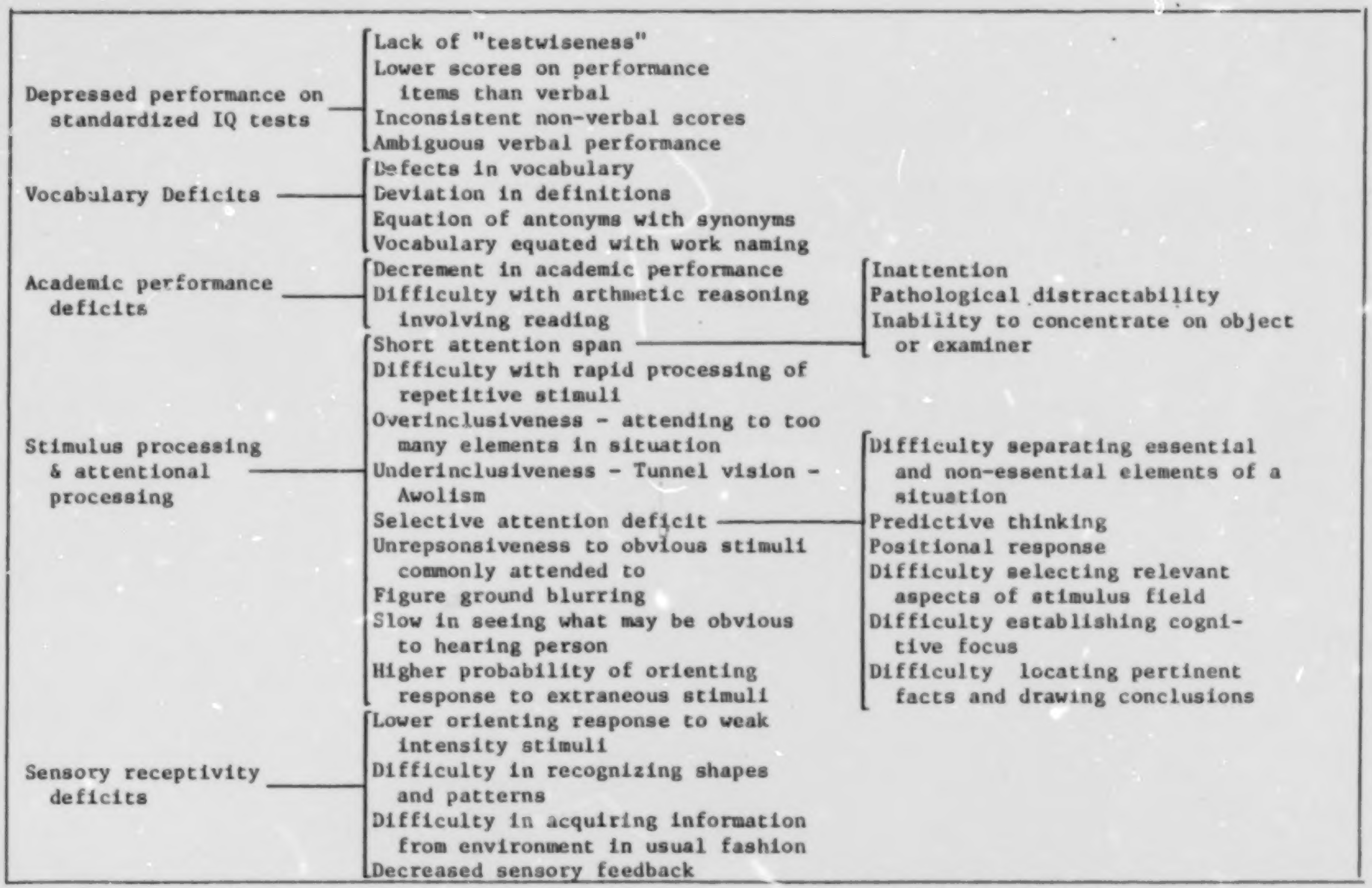

Depressed performance on standardized IQ tests
Lack of "testwiseness"
Lower scores on performance items than verbal
Inconsistent non-verbal scores
Ambiguous verbal performance
Vocabulary Deficits
Defects in vocabulary
Deviation in definitions
Equation of antonyms with synonyms
Vocabulary equated with work naming
Academic performance deficits
Decrement in academic performance
Difficulty with arthmetic reasoning involving reading
Stimulus processing & attentional processing
Short attention span
Inattention
Pathological distractability
Inability to concentrate on object or examiner
Difficulty with rapid processing of repetitive stimuli
Overinclusiveness - attending to too many elements in situation
Underinclusiveness - Tunnel vision - Awolism
Selective attention deficit
Difficulty separating essential and non-essential elements of a situation
Predictive thinking
Positional response
Difficulty selecting relevant aspects of stimulus field
Difficulty establishing cognitive focus
Difficulty locating pertinent facts and drawing conclusions
Unrepsonsiveness to obvious stimuli commonly attended to
Figure ground blurring
Slow in seeing what may be obvious to hearing person
Higher probability of orienting response to extraneous stimuli
Sensory receptivity deficits
Lower orienting response to weak intensity stimuli
Difficulty in recognizing shapes and patterns
Difficulty in acquiring information from environment in usual fashion
Decreased sensory feedback

Figure 3-7 (continued-A). Tree diagram for cognitive-intellectual needs.

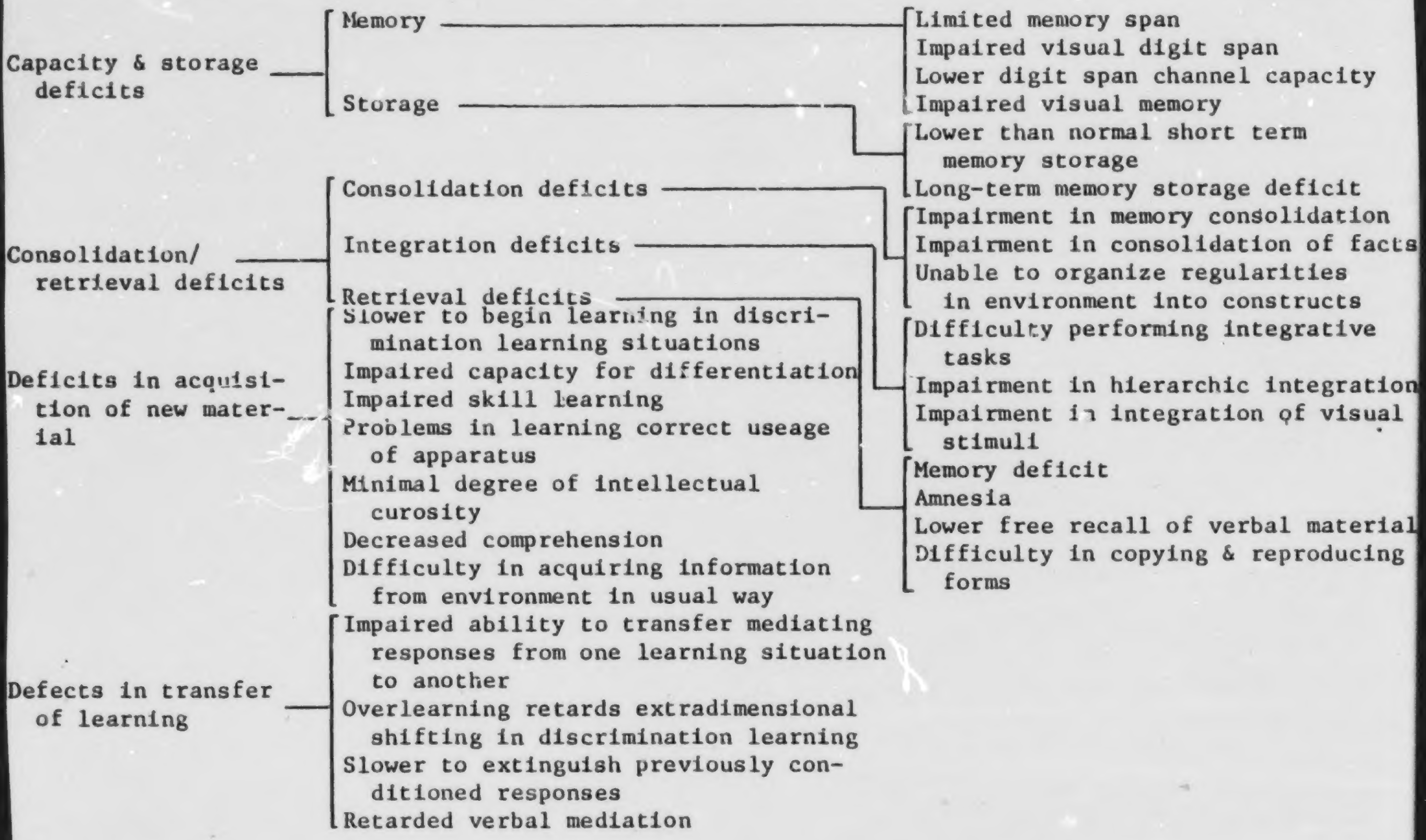

Capacity & storage deficits
Memory
Storage
Limited memory span
Impaired visual digit span
Lower digit span channel capacity
Impaired visual memory
Lower than normal short term memory storage
Long-term memory storage deficit
Consolidation/ retrieval deficits
Consolidation deficits
Integration deficits
Retrieval deficits
Impairment in memory consolidation
Impairment in consolidation of facts
Unable to organize regularities in environment into constructs
Difficulty performing integrative tasks
Impairment in hierarchic integration
Impairment in integration of visual stimuli
Memory deficit
Amnesia
Lower free recall of verbal material
Difficulty in copying & reproducing forms
Deficits in acquisition of new material
Slower to begin learning in discrimination learning situations
Impaired capacity for differentiation
Impaired skill learning
Problems in learning correct useage of apparatus
Minimal degree of intellectual curosity
Decreased comprehension
Difficulty in acquiring information from environment in usual way
Defects in transfer of learning
Impaired ability to transfer mediating responses from one learning situation to another
Overlearning retards extradimensional shifting in discrimination learning
Slower to extinguish previously conditioned responses
Retarded verbal mediation

Figure 3-7 (continued-B). Tree diagram for cognitive-intellectual needs.

- Deficits in level of thinking and reasoning (Abstractness)
  - Use of concrete over abstract reasoning
  - Less common abstraction in language
  - Regression to earlier thought processes
  - Inability to sustain abstract conceptualization
  - Words lose connotative power and become conceret entities
- Deficits in functioning of reasoning and thought processes
  - Slow to develop or inferior conceptual thinking
  - Slowed thinking
  - Disturbances in symbolic (visual) thinking
  - Preservation
    - Of verbal and phsycial behavior
    - Repetition of ideas
  - Confusion-Inability to think
  - Disturbances in symbolic abstract thinking
  - Instability in work associations from day to day
  - Impaired processes of formal logic and reasoning
  - Failure in judgement and planning
- Pathological thought
  - Pathological thought content
    - Distortion of body image
    - Delusional thinking
    - Adualism-hallucinations
    - Disburgances of language
    - Deficits in reality testing
    - Delirious reactions
  - Pathological thought processes
    - Thought blocking
    - Retreat from reality
    - Confabulated or autistic responding
    - Exaggerated responsiveness to emotional stimuli
    - Fears and wishes rather than logical connections control trend of thought
    - Pronounced fragmentation
    - Disorientation leading to seizure
    - Performing without conscious volition

Figure 3-7 (continued-C). Tree diagram for cognitive-intellectual needs.

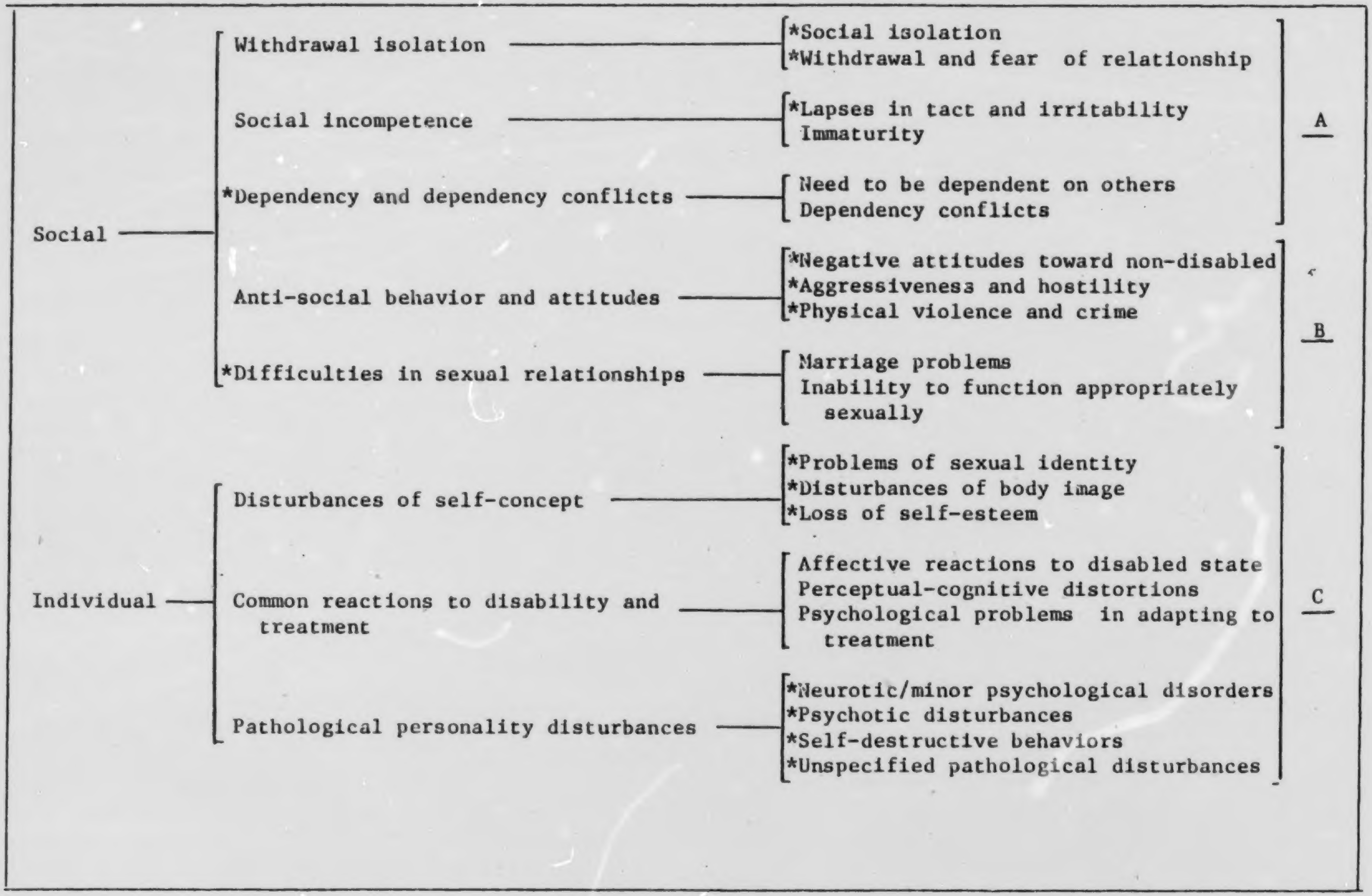

Social
Withdrawal isolation
*Social isolation
*Withdrawal and fear of relationship
Social incompetence
*Lapses in tact and irritability
Immaturity
*Dependency and dependency conflicts
Need to be dependent on others
Dependency conflicts
A
Anti-social behavior and attitudes
*Negative attitudes toward non-disabled
*Aggressiveness and hostility
*Physical violence and crime
*Difficulties in sexual relationships
Marriage problems
Inability to function appropriately sexually
B
Individual
Disturbances of self-concept
*Problems of sexual identity
*Disturbances of body image
*Loss of self-esteem
Common reactions to disability and treatment
Affective reactions to disabled state
Perceptual-cognitive distortions
Psychological problems in adapting to treatment
Pathological personality disturbances
*Neurotic/minor psychological disorders
*Psychotic disturbances
*Self-destructive behaviors
*Unspecified pathological disturbances
C

Figure 3-8. Tree diagram for social/attitudinal needs.

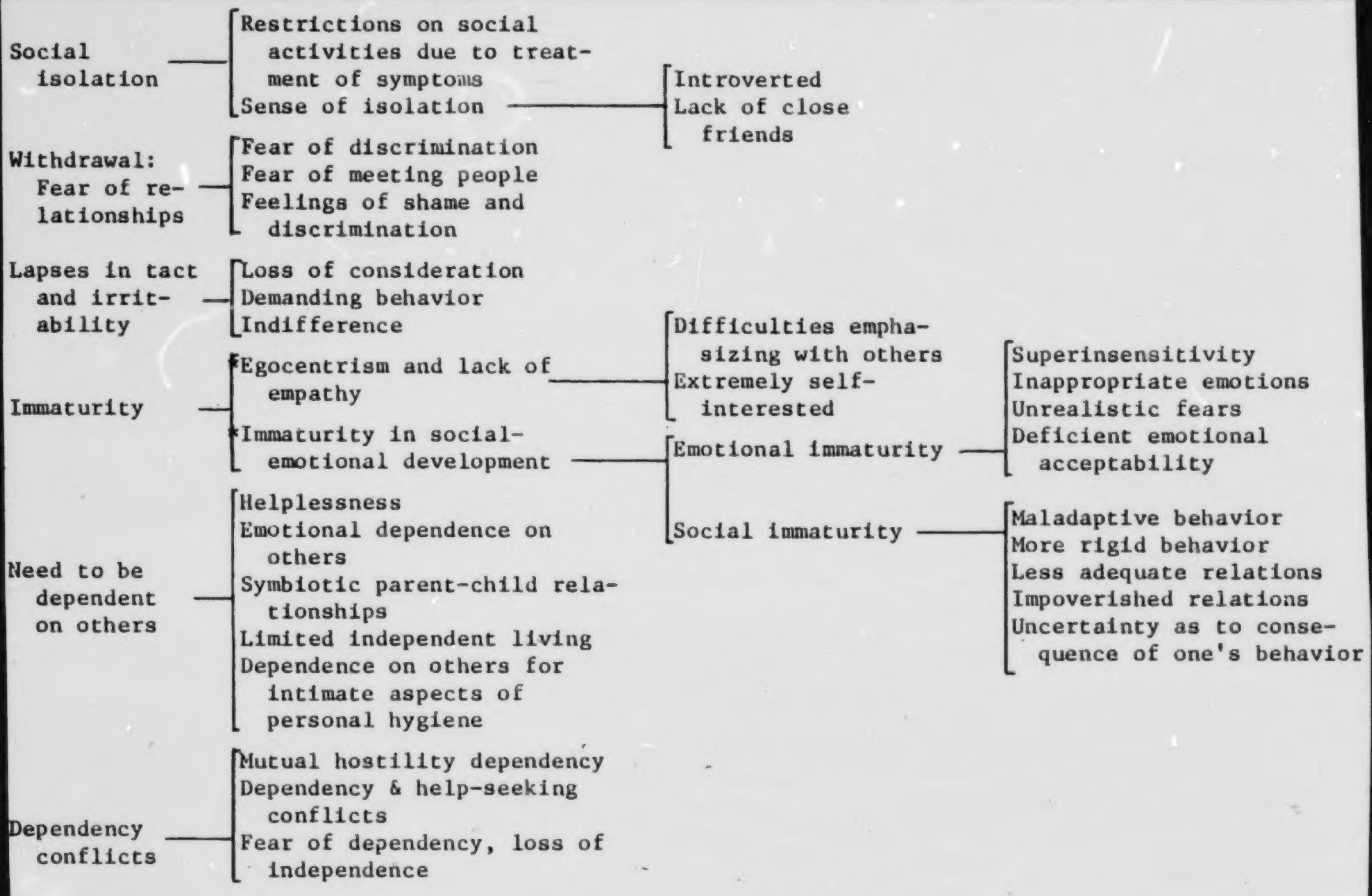

Social isolation
Restrictions on social activities due to treatment of symptoms
Sense of isolation
Introverted
Lack of close friends
Withdrawal: Fear of relationships
Fear of discrimination
Fear of meeting people
Feelings of shame and discrimination
Lapses in tact and irritability
Loss of consideration
Demanding behavior
Indifference
Immaturity
Egocentrism and lack of empathy
Difficulties emphasizing with others
Extremely self-interested
Immaturity in social-emotional development
Emotional immaturity
Superinsensitivity
Inappropriate emotions
Unrealistic fears
Deficient emotional acceptability
Social immaturity
Maladaptive behavior
More rigid behavior
Less adequate relations
Impoverished relations
Uncertainty as to consequence of one's behavior
Need to be dependent on others
Helplessness
Emotional dependence on others
Symbiotic parent-child relationships
Limited independent living
Dependence on others for intimate aspects of personal hygiene
Dependency conflicts
Mutual hostility dependency
Dependency & help-seeking conflicts
Fear of dependency, loss of independence

Figure 3-8 (continued-A). Tree diagram for social-attitudinal needs.

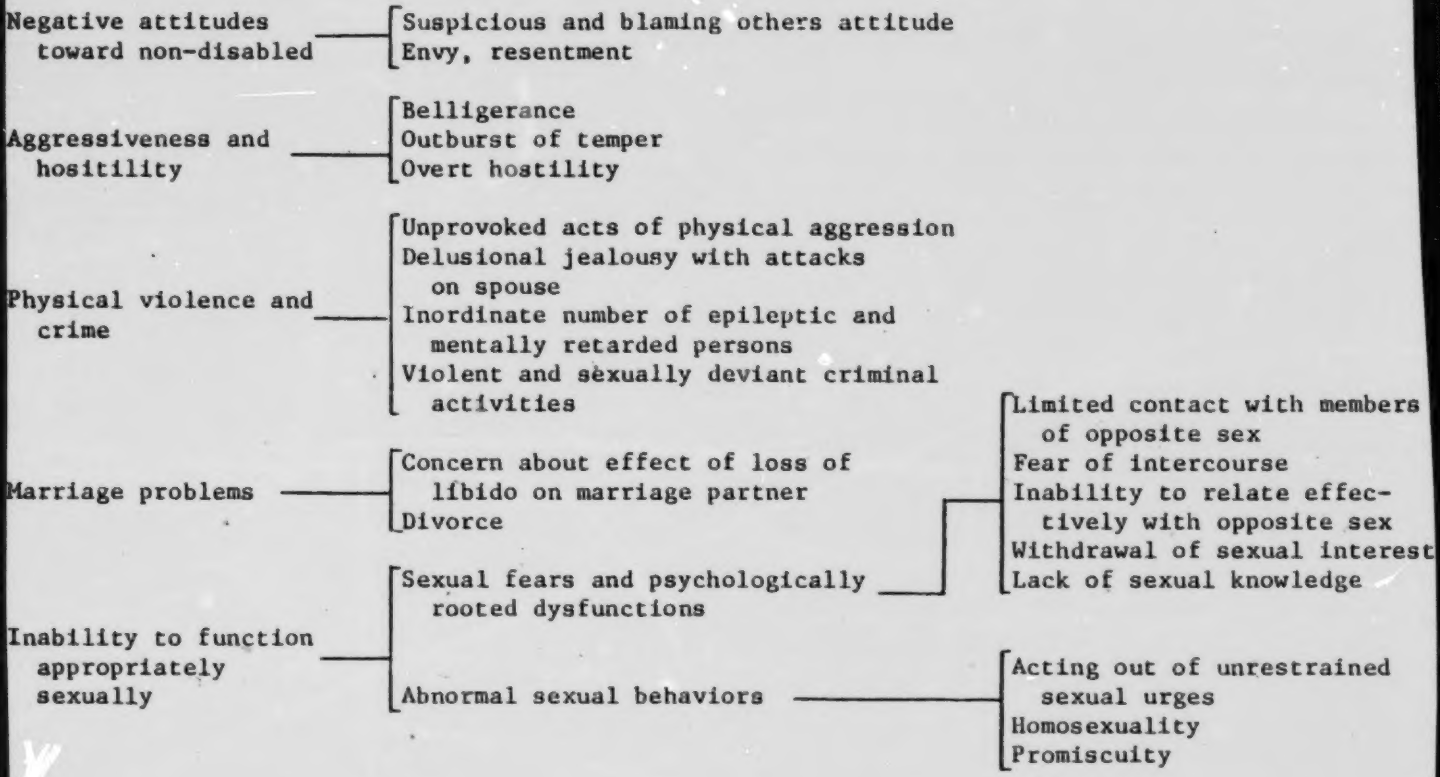

Negative attitudes toward non-disabled
Suspicious and blaming others attitude
Envy, resentment
Aggressiveness and hositility
Belligerance
Outburst of temper
Overt hostility
Physical violence and crime
Unprovoked acts of physical aggression
Delusional jealousy with attacks on spouse
Inordinate number of epileptic and mentally retarded persons
Violent and sexually deviant criminal activities
Marriage problems
Concern about effect of loss of libido on marriage partner
Divorce
Inability to function appropriately sexually
Sexual fears and psychologically rooted dysfunctions
Limited contact with members of opposite sex
Fear of intercourse
Inability to relate effectively with opposite sex
Withdrawal of sexual interest
Lack of sexual knowledge
Abnormal sexual behaviors
Acting out of unrestrained sexual urges
Homosexuality
Promiscuity

Figure 3-8 (continued-B). Tree diagram for social-attitudinal needs.

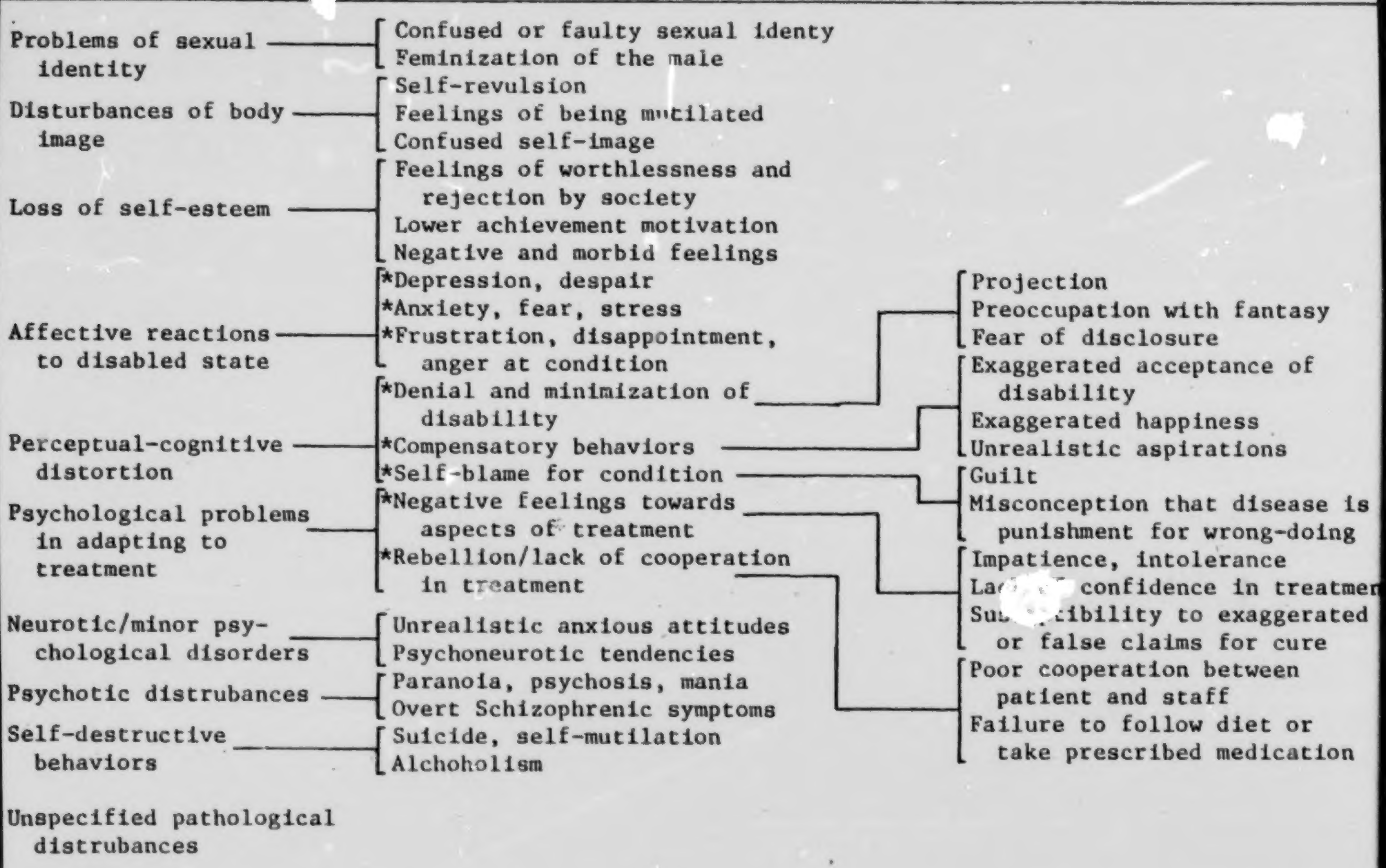

Problems of sexual identity
Confused or faulty sexual identy
Feminization of the male
Disturbances of body image
Self-revulsion
Feelings of being mutilated
Confused self-image
Loss of self-esteem
Feelings of worthlessness and rejection by society
Lower achievement motivation
Negative and morbid feelings
Affective reactions to disabled state
*Depression, despair
*Anxiety, fear, stress
*Frustration, disappointment, anger at condition
Perceptual-cognitive distortion
*Denial and minimization of disability
*Compensatory behaviors
*Self-blame for condition
Psychological problems in adapting to treatment
*Negative feelings towards aspects of treatment
*Rebellion/lack of cooperation in treatment
Neurotic/minor psychological disorders
Unrealistic anxious attitudes
Psychoneurotic tendencies
Psychotic distrubances
Paranoia, psychosis, mania
Overt Schizophrenic symptoms
Self-destructive behaviors
Suicide, self-mutilation
Alchoholism
Unspecified pathological distrubances
Projection
Preoccupation with fantasy
Fear of disclosure
Exaggerated acceptance of disability
Exaggerated happiness
Unrealistic aspirations
Guilt
Misconception that disease is punishment for wrong-doing
Impatience, intolerance
La[illegible] confidence in treatmen
Su[illegible]tibility to exaggerated or false claims for cure
Poor cooperation between patient and staff
Failure to follow diet or take prescribed medication

Figure 3-8 (continued-C). Tree diagram for social-attitudinal needs.

3. Need statements are not weighted or ranked by severity. One obviously has a greater need in the Health Life Function if one is in immanent risk of death than if one has translucent skin, but in what follows, one need is weighted equally with the other. Thus, the fact that one group has more need statements than another is no sign that is has a more "severe" disability. This again points to the problem of not being able to obtain sufficient data on the factors associated with the occurrence of the need.

4. The types and numbers of need statements were also affected by the methodology used and the data from which need statements were drawn. Since the literature on some disabilities is more advanced and empirical than the literature on others, the number of statements for a group may partially reflect the quality of the body of literature. Unfortunately, differences in research style among the literature reviewers also biased results since some reports were more exhaustive of the literature than others.

What can be done with this information then? First, the categories themselves can be used as a conceptual framework for analysis, a stimulator of thought. Secondly, it is useful to examine, within any disability group, and for the disability groups as a set, which types of needs most frequently appear in the literature. Third, one can determine which disabilities share common types of needs and, by inference, might profit from similar classes of program and technologies.

The five Life Function Need Trees are included in this report as figures 3-4 through 3-8. In constructing the trees, one

TABLE 3-5
NEED CONSTELLATION TABLE-HEALTH

NEED CONSTELLATION TABLE-HEALTH

NEED CONSTELLATIONS	DISABILITIES														
	MOTOR			BEHAVIORAL			CHRONIC						SENSES		
	ST	SCI	CP	EP	MR	SZ	RA	CHD	EM	CRC	KD	DM	VI	HI	TOTAL
1. FATIGUE AND SLEEP DISTURBANCES	1		3	4		2	1	1	3	1	4				20
2. THREATS TO NORMAL SYSTEM FUNCTIONING		4	1		1	2	4		2	4	6	5	1	2	32
3. SENSATION DISCOMFORTS AND INTERFERENCE	10	2	4	2		2	8	1	2	2	5				38
4. ENVIRONMENTAL DISCOMFORTS-NEED FOR CONTROL		1						1	3	1	3	1			10
5. DEVELOPMENTAL PHYSICAL DEFORMITIES				1	2	1					4				8
6. GROWTH RATE RETARDATION						1	2				3				6
7. EARLY MORTALITY		1		1	2			1		2		1			8
8. BRAIN DISORDERS	3		1	1	2						3			1	11
9. SPINAL CORD DISORDERS		5					1				2	1			9
10. GENERALIZED CENTRAL NERVOUS SYSTEM DISORDERS											1		1		2
11. BLOOD DISORDERS		1		4			3		2	1	5	1		1	18
12. HEART DISORDERS	1	1		1	1		2		3		2			1	12
13. DISORDERS OF THE ARTERIES AND VEINS	1						3	2	1	1	6	1	1		16
14. DISORDERS OF THE DIGESTIVE ORGANS				1			1		2		6				10
15. DIGESTIVE DISORDERS	1		1	1			2		2		4	1			12
16. DIETARY PROBLEMS				1	1	2				1	1				6
17. KIDNEY DISORDERS		5		1							3	2			11
18. URINARY TRACT DISORDERS	2	4					1				8	4			19
19. INTESTINAL DISORDERS		1								9	6				16
20. PERSPIRATION PROBLEMS		1					1				1	1			4
21. METABOLIC DYSFUNCTION	1			1	1		2			1	3	2	1		12
22. MALFUNCTIONING OF REPRODUCTIVE ORGANS		3				2	3			1	6	1			16
23. SEXUAL AND REPRODUCTIVE LIMITATIONS		1				1	1	1			2	2			8
24. LUNG DISEASES	1				3						3				7
25. OTHER DIFFICULTIES IN VENTILATION	3	1		2				1	4		1				12
26. BONE DYSFUNCTIONING	1	5		1			2				4	1			14
27. DENTAL PROBLEMS			1		1						2				4
28. SKIN DISORDERS	1	1		4	1		8			1	8				24
29. GENERALIZED TISSUE DISORDERS	3	1		2			6			2	6	1			21
TOTAL	29	38	11	28	15	13	51	8	24	27	108	25	4	5	386

*See Key to Disability Codes, Table 3-7

TABLE 3-6
NEED CONSTELLATION TABLE-SOCIAL-ATTITUDINAL

NEED CONSTELLATION TABLE-SOCIAL-ATTITUDINAL

NEED CONSTELLATIONS	DISABILITIES														
	MOTOR			BEHAVIORAL			CHRONIC						SENSES		
	ST	SCI	CP	EP	MR	SZ	RA	CHD	EM	CRC	KD	DM	VI	HI	TOTAL
1. SOCIAL ISOLATION	1		1		2	1	1			1	3	1		4	15
2. WITHDRAWAL AND FEAR OR RELATIONSHIP	1	4	1			5	2			1	1			3	18
3. LAPSES IN TACT AND IRRITABILITY	3	2	1			1			1		3				11
4. EGOCENTRISM AND LACK OF EMPATHY	1			1		2							1	2	7
5. IMMATURITY IN SOCIAL - EMOTIONAL DEVELOPMENT		3		6	3	2					2	1	1	7	25
6. DEPENDENCY AND DEPENDENCY CONFLICTS	1	1		1	3	2	3				5		2	1	19
7. NEGATIVE ATTITUDES TOWARD NON-DISABLED	1	1	1	1			2			1					7
8. AGGRESSIVENESS AND HOSTILITY	1	2		3			3				1	1	1	1	13
9. PHYSICAL VIOLENCE AND CRIME	1	1		3	1										6
10. DIFFICULTY IN SEXUAL RELATIONSHIPS		2		1	3	4					3				13
11. PROBLEMS OF SEXUAL IDENTITY		1				1	1	1			2				6
12. DISTURBANCES OF BODY IMAGE		2					1			1	2				6
13. LOSS OF SELF-ESTEEM	2	7		1	4	2		1	1		1		1	1	21
14. DEPRESSION, DESPAIR	2	2	1	2		1	2	1	1	1	2	1			16
15. ANXIETY, FEAR, STRESS	2	3		4	2		2	1		2	3	1	1	1	22
16. FRUSTRATION, DISAPPOINTMENT, ANGER AT CONDITION	2	2		2			5	2		1	1				15
17. DENIAL AND MINIMIZATION OF DISABILITY		4	1				1	5				1		1	13
18. COMPENSATORY BEHAVIORS		5				1	1			1				1	9
19. SELF-BLAME FOR CONDITION	1	2					1				1	1	1		7
20. NEGATIVE FEELINGS TOWARD ASPECTS OF TREATMENT	1	1					1			1	11	1			16
21. REBELLION/LACK OF COOPERATION IN TREATMENT				1	1						3	2	1		8
22. NEUROTIC MINOR PSYCHOLOGICAL DISORDERS		5		2		2		1			2			2	14
23. PSYCHOTIC DISTURBANCES	4	1		3		1	1				1			2	13
24. UNSPECIFIED PATHOLOGICAL DISTURBANCES	2			1	1						2	1			7
25. SELF-DESTRUCTIVE BEHAVIORS		1		1	2	2				1	1	1			9
TOTAL	26	52	6	34	22	27	27	12	3	11	50	12	9	26	316

*See Key to Disability Codes, Table 3-7

TABLE 3-7
NEED CONSTELLATION TABLE-MOBILITY

NEED CONSTELLATION TABLE-MOBILITY

NEED CONSTELLATIONS	DISABILITIES														
	MOTOR			BEHAVIORAL			CHRONIC						SENSES		
	ST	SCI	CP	EP	MR	SZ	RA	CHD	EM	CRC	KD	DM	VI	HI	TOTAL
1. INTERFERENCE WITH VOLUNTARY MOVEMENTS	5	2	6		2		1				1				17
2. EXCESSIVE INVOLUNTARY MOVEMENT	4	3	7	2							1				17
3. HYPERACTIVITY				1		2									3
4. KINESTHETIC MOTOR REACTIONS AND PERCEPTION DIFFICULTIES	1		2		1	1							1	3	9
5. PROBLEMS IN COORDINATING BODY MOVEMENTS	1	3	1	1	4	1							4		15
6. DIFFICULTIES IN FINE MOTOR CONTROL AND TACTILE PERCEPTION	6	3	1	1	1		4						1		17
7. BALANCE PROBLEMS	1		1	1		1					2			3	9
8. TONAL ABNORMALITIES, ATROPHY, WEAKENING OF MUSCLES	4	1	2	1		2	1				2				13
9. JOINT PROBLEMS	1		1				8				3				13
10. POSTURAL ABNORMALITIES	3		4		1										8
11. PARALYSIS OR LACK OF MOVEMENT	4	4	1	2		2									13
12. INABILITY OR LIMITED ABILITY TO WALK	1	1	1		4		3				3	1	1		15
13. GAIT PROBLEMS AND FALLS	3		6										1	1	11
14. LIMITATIONS IN RECREATION AND PHYSICAL EXERTION		1			2			2			3	2	1		11
15. DIFFICULTIES DUE TO ENVIRONMENTAL OBSTACLES	3	8					2						1		14
16. DIFFICULTIES IN MANAGING VEHICLE TRANSPORTATION	1	3			1			2	1						8
17. ACTIVITIES OF DAILY LIFE IN THE HOME (LIMITATIONS OF)	4	15	2					7							28
TOTAL	42	44	35	9	16	9	26	4	1		15	3	10	7	221

Key to Disability Codes

ST=Stroke	MR=Mental Retardation	EM=Emphysema	VI=Visual Impairment
SCI=Spinal Cord Injury	SZ=Zchizophrenia	CRC=Colon/Rectum Cancer	HI=Hearing Impairment
CP=Cerebral Palsy	RA=Rheumatoid Arthritis	KD=Kidney Disease	
EP=Epilepsy	CHD=Coronary Heart Disease	DM=Diabetes Mellitus	

TABLE 3-8
NEED CONSTELLATION TABLE-COGNITIVE INTELLECTUAL

NEED CONSTELLATION TABLE-COGNITIVE INTELLECTUAL

NEED CONSTELLATION	DISABILITIES														
	MOTOR			BEHAVIORAL			CHRONIC						SENSES		
	ST	SCI	CP	EP	MR	SZ	RA	CHD	EM	CRC	KD	DM	VI	HI	TOTAL
1. DEPRESSED PERFORMANCE ON STANDARDIZED IQ TEST			1	9	1	4							1	2	18
2. VOCABULARY DEFICITS						2							2		4
3. ACADEMIC PERFORMANCE DEFICITS				4	5						1		1		11
4. STIMULUS PROCESSING AND ATTENTIONAL DEFICITS	1		1	4	7	11						1		2	27
5. SENSORY RECEPTIVITY DEFICITS			1		4										5
6. CAPACITY AND STORAGE DEFICITS	1			2	1									2	6
7. CONSOLIDATION/RETRIEVAL DEFICITS				3	2	4			1		1		1		12
8. DEFICITS IN ACQUISITION OF NEW MATERIAL	1			4	6	1			1	1				1	15
9. DEFICITS IN TRANSFER LEARNING					4									1	5
10. DEFICITS IN LEVEL OF THINKING AND REASONING (ABSTRACTNESS)			1		1							4	1		7
11. DEFICITS IN FUNCTIONING OF REASONING AND THOUGHT PROCESS	4			6	2	6								2	20
12. PATHOLOGICAL THOUGHT CONTENT	1					6					1				8
13. PATHOLOGICAL THOUGHT PROCESS	1		1			6					1				9
TOTAL	9		5	32	33	40			2	1	4	5	6	10	147

Key to Disability Codes

ST=Stroke	MR=Mental Retardation	EM=Emphysema	VI=Visual Impairment
SCI=Spinal Cord Injury	SZ=Schizophrenia	CRC=Colon/Rectum Cancer	
CP=Cerebral Palsy	RA=Rheumatoid Arthritis	KD=Kidney Disease	HI=Hearing Impairment
EP=Epilepsy	CHD=Coronary Heart Disease	DM=Diabetes Mellitus	

TABLE 3-9
NEED CONSTELLATION TABLE-COMMUNICATION

NEED CONSTELLATION TABLE-COMMUNICATION

NEED CONSTELLATIONS

NEED CONSTELLATIONS	DISABILITIES														
	MOTOR			BEHAVIORAL			CHRONIC						SENSES		
	ST	SCI	CP	EP	MR	SZ	RA	CHD	EM	CRC	KD	DM	VI	HI	TOTAL
1. HEARING	1		2	1	1	4								22	31
2. BLINDNESS AND REFRACTORY TYPE ERRORS	2		3	1	1						3	2	10	2	24
3. OCULAR DISEASES							4				4	1			9
4. EYE MUSCLE ABNORMALITIES	1		5	2		1							5		14
5. SPATIAL DEFICIENCY			2			3							2		7
6. MULTIPLE SENSORY INTEGRATION PROBLEMS			1	1		1									3
7. READING					1									1	4
8. WRITING						1					1			2	4
9. NON-VERBAL COMMUNICATION	1														1
10. SPEECH IDIOSYNCRACIES IN CONTENT AND STYLE					2	12							1		15
11. DEFICITS IN LANGUAGE SKILLS	1		1		7	1									10
12. ARTICULATION AND OTHER SPEECH DEVIATIONS			5	1	2								1	4	13
13. VOCALIZATION DISTURBANCES ASSOCIATED WITH MUSCLE DYSFUNCTION OR PARALYSIS	4		4		1	2									11
14. APHASIA	3		1		2										6
TOTAL	13		24	6	19	25	4				8	3	19	31	152

Key to Disability Codes

ST=Stroke	MR=Mental Retardation	EM=Emphysema	VI=Visual Impairment
SCI=Spinal Cord Injury	SZ=Schizophrenia	CRC=Colon/Rectum Cancer	HI=Hearing Impairment
CP=Cerebral Palsy	RA=Rheumatoid Arthritis	KD=Kidney Disease	
EP=Epilepsy	CHD=Coronary Heart Disease	DM=Diabetes Mellitus	

The Need Constellation tables are still so complex that it is difficult--pardon the expression--to see the forest for the trees. Thus, we present here some major trends at the life function level of analysis and within each life function. Then we consider three topics of special interest: the interrelationships among the case study disabilities, the effects of technology on life function needs, and the perspectives of disabled persons concerning their needs as expressed in interviews conducted by graduate students in rehabilitation counseling.

Major Trends in Life Function Needs

Table 3-10 presents, for each disability, the percentage of need statements which fell in each life function. Of the total of 1222 need statements, 32% were in Health, 26% were in Social-Attitudinal Functioning, 18% were in Mobility, 12% were in Cognitive-Intellectual Functioning, and 12% were in Communication. It is quite apparent that disabled persons do not have needs which are restricted to one area of life functioning, although all have greater needs in some areas than in others. There are at least some need statements in all five life functions for most disabilities, and few cells with zeros in them. Not only are needs interrelated (for example, the person with mobility limitations is often depressed about restrictions on mobility), but disability, it must be concluded, is a phenomenon with complex and multiple effects on functioning.

An attempt was made to identify subsets of case study disabilities which displayed similar types of needs. Examination of findings led to classifying the disabilities into four subgroups.

TABLE 3-10

PERCENTAGE OF NEED STATEMENTS IN EACH FUNCTION BY DISIBILITY

	MOTOR			BEHAVIORAL			CHRONIC DISEASE						SENSES		TOTAL	
LIFE FUNCTIONS	SCI	ST	CP	MR	EP	Sz	RA	CHD	EM	CRC	KD	DM	HI	VI	%	#
HEALTH	28	24	14	14	26	11	47	33	80	69	58	52	7	7	32	386
SOC-ATT	39	22	06	21	31	24	25	50	10	28	27	25	38	15	26	316
MOBILITY	33	35	44	16	08	08	24	17	03	0	08	06	13	17	18	221
COG-INTELL	0	08	06	31	29	35	0	0	07	03	02	10	13	10	12	147
COMM	0	11	30	18	06	22	04	0	0	0	04	06	28	52	12	152
													TOTAL			1222

ABBREVIATIONS FOR THE FOURTEEN CASE STUDY DISABILITIES

SCI=Spinal Cord Injury
ST=Stroke
CP=Cerebral Palsy
MR=Mental Retardation
EP=Epilepsy
SZ=Schizophrenia
RA=Rheumatoid Arthritis

CHD=Coronary Heart Disease
EM=Emphysema
CRC=Colon/Rectum Cancer
KD=Kidney Disease
DM=Diabetes Mellitus
HI=Hearing Impairment
VI=Visual Impairment

An analysis of Table 10 indicates that certain case study disabilities exhibit similar impairments, at least at the general life function level. For example, spinal cord injury, stroke, and cerebral palsy have been grouped as Motor Disabilities. These three disabilities, which result in varying forms of paralysis or loss of motor control, have many impairments in the mobility life function area and the fewest impairments in the cognitive-intellectual life function area. Health impairments rank second for stroke and third for cerebral palsy and spinal cord injury. Additionally, the spinal cord injured have a large number of social-attitudinal impairments. This may be due to the fact that in order to function effectively in their environment, the spinal cord injured must make major social-attitudinal adjustments.

Three groups which might be termed "behavioral disabilities"--mental retardation, epilepsy, and schizophrenia--also display a number of similar life function impairments. For example, both social-attitudinal and cognitive-intellectual impairments are numerous in all three case study disabilities while mobility needs are infrequent.

The sensory disorders, hearing impairments (HI) and visual impairments (VI), have numerous need statements in the communication life function. Furthermore, the visually impaired have the highest percentage of need statements in the communication life function of any of the fourteen disability groups. While the hearing impaired also have a large percentage of statements in this category, the figure is not as high as the cited for the visually impaired. This may be due to the fact that researchers have not been able, in many cases, to weight specific need statements according to the severity of the impairment or the numbers affected by the impairment. Thus, a lower percentage in a given category does not always indicate less severe impairments in the life function.

There is also great disparity between the visually and hearing impaired in the social-attitudinal life function. The hearing impaired have a larger percentage of statements in this need area than the visually impaired do. Furthermore, the hearing impaired have a higher percentage of social-attitudinal problems than communication problems. Again, it was difficult for researchers to determine the severity of the problems and therefore the percentages can only be considered as indicators of the extent of communication and social-attitudinal life function problems. The hearing impaired, when compared to the three case study disabilities classified as behavioral, exhibit a similar, though somewhat higher, percentage of problems in the social-attitudinal life function area. This reflects evidence that the hearing impaired are sometimes emotionally immature and are limited in social interaction by their lack of oral communication skills.

The remainder of the case study disabilities--rheumatoid arthritis, coronary heart disease, emphysema, colon/rectum cancer, kidney disease, and diabetes mellitus--have been classified as chronic disease disabilities. The similarities, by percentage, among the life function need areas are close. A quick glance at the table shows all but one of the disabilities are significantly impaired in the health life function area, with the highest percentages of impairments falling in this life function. The social attitudinal life function area ranks second in all disabilities except one, with similar percentages in all these disabilities. Coronary heart disease, the exception in both the health and social-attitudinal life functions, has the two life functions reversed, with social-attitudinal having the highest percentage and health the next highest.

The communication life function has a low impairment percentage (ranging from 0-6%) in the chronic disease disabilities, ranking either fourth or fifth. There is not much percentage difference between the fourth and fifth ranked life functions, no more than four percentage points, with coronary heart disease and colon/rectum cancer having zero percent registered for both the fourth and fifth ranked life functions.

In general, persons disabled by chronic disease are most significantly impaired in the health and social-attitudinal life functions, with less impairment in mobility and minimal impairment in the communication and cognitive-intellectual life functions.

Although we have noted several limitations of this analysis, the basic underlying notion of assessing functional needs of various disabled groups has merit. Take, for example, the concept of developmental disabilities. A federal Developmental Disabilities program was initiated on the assumption that mentally retarded, epileptic, cerebral palsied, and autistic children have similar impairments and common needs. Is this assumption valid? Our data suggest that there may be some significant differences among the developmental disabilities. For example, the cerebral palsy literature contains many references to mobility needs, needs which are relatively infrequent for the mentally retarded and epileptic. This was the primary basis for including cerebral palsy as a motor rather than a behavioral disability in the present analysis. Communication needs also emerged as a major need area for the cerebral palsied but not for the other two developmental disabilities. By contrast, mental retardation and epilepsy are associated with cognitive-intellectual difficulties, which are less frequently mentioned in the cerebral palsy literature. While the mentally retarded and epileptic share similar need profiles, there are important differences between them--for example, the preponderance of health needs for epilepsy, and the relatively greater needs in the communication life function for the mentally retarded. While we are not prepared to conclude that the concept of developmental disabilities is a faulty one, we are suggesting that the strategy of comparing need profiles based on standardized measures of need (rather than on the more unreliable data provided by the existing research literature) is a sound strategy for organizing service delivery systems along functional lines.

Table 3-11 represents another way of summarizing the main patterns of need. It shows for each of the five life functions, the average percent of need statements in the life function for the four major disability groupings. Bearing in mind the differences within groupings, this table indicates the following:

TABLE 3-11

AVERAGE PERCENT OF STATEMENTS IN EACH LIFE FUNCTION FOR FOUR MAJOR DISABILITY CLASSES

Health	Motor	21	Health LF primarily for chronic diseases
	Behavioral	17	
	Chronic	56	
	Sensory	7	
Soc. Att.	Motor	22	Social attitudinal - a major need across all disabilities
	Behavioral	25	
	Chronic	27	
	Sensory	26	
Mobility	Motor	39	Motor disability
	Behavioral	11	
	Chronic	10	
	Sensory	15	
Cog. Intell.	Motor	5	Behavioral disability
	Behavioral	32	
	Chronic	4	
	Sensory	12	
Comm.	Motor	14	Sensory
	Behavioral	15	
	Chronic	2	
	Sensory	40	

1. Health needs are predominant among those with chronic diseases but also significantly affect those with motor and behavioral disabilities.

2. Social-attitudinal needs and difficulties affect all disability groupings approximately equally and represent a major area in which programs initiated might be expected to be applicable to the whole range of disability.

3. As expected, mobility needs are most prevalent for those with motor disabilities, but other disabled persons face mobility problems.

4. Cognitive-intellectual needs are the distinguishing characteristics of the behavioral disabilities and rarely affect those with motor disabilities or chronic diseases.

5. Communication needs, again quite obviously, are central for those with sensory impairments, particularly as they restrict information input, but only those persons in the chronic disease category are relatively free of communication problems.

The fact that disabilities which are often perceived as similar display similar patterns of life function needs affirms the validity of the life function analysis.

Patterns of Need Within Life Functions

Although the need trees and need constellations are useful for a number of reasons (see above), the researchers have noted certain patterns emerging at the more abstract levels of the need trees. For each life function, the need constellations were placed within more inclusive categories within the need tree. The tables accompanying this section list these more inclusive categories and indicate whether particular disability groups have need statements within these categories. Because of problems encountered in counting needs, these tables define need as one or more need statements in an area, without regard to number.

Health. The Health life function area is extremely broad in scope. Therefore it is somewhat difficult to discern any pattern within the health life function area. The health life function has the greatest number of need statements (386), with all fourteen disabilities having numerous problems, and each of these problems affect seven or more disabilities. (see Table 3-12).

At the most abstract level, this life function was divided into two major groupings: Disruptions of Normal Body Processes and Abnormalities of Specific Body Systems. The first grouping includes those impairments which tend to debilitate the entire body. These impairments are more generalized impairments and result in lowered resistance to disease and interference with all activity--i.e., pain, fever, shock. The second grouping includes impairments rooted in specific diseases and organ disorders although the second grouping, Abnormalities of Specific Body Systems, has a larger percentage of the total need statements, impairments within the first health grouping, Disruptions of Normal Body Processes, generally affect a greater number of disability groups.

TABLE 3-12

HEALTH NEED STATEMENTS IN NEED CONSTELLATION "CLUSTER" BY DISABILITY

		DISABILITIES															
		MOTOR			BEHAVIORAL			CHRONIC DISEASES						SENSES		TOTAL	NO. OF DISABILITY GROUPS AFFECTED
		ST	SCI	CP	MR	EP	SZ	RA	CHD	EM	CRC	KD	DM	HI	VI	%	
Disruption of Normal Body Processes	1. Strains upon the organism	X	X	X	X	X	X	X	X	X	X	X	X	X	X	14	14
	2. Discomfort to the organism	X	X	X		X	X	X	X	X	X	X	X			12	11
	3. Abnormalities of the organism & Interruptions of the Normal Life Cycle		X		X	X	X	X	X		X	X	X			6	9
	4. Abnormalities of Specific Structural Components	X	X	X	X	X		X			X	X	X			16	9
Abnormalities of Specific Body Systems	5. Central Nervous System Disorders	X	X	X	X	X		X				X	X	X	X	6	10
	6. Circulatory System Disorders	X	X		X	X		X	X	X	X	X	X	X	X	12	12
	7. Digestive System Disorders	X		X	X	X	X	X		X	X	X	X			7	10
	8. Excretory System Disorders	X	X			X		X			X	X	X			13	7
	9. Metabolic Disorders	X			X	X		X			X	X	X		X	3	8
	10. Reproductive System Disorders		X				X	X	X		X	X	X			6	7
	11. Respiratory System Disorders	X	X		X	X			X	X		X				5	7

100 %

Total # of Need Statements 386

Social-attitudinal Functioning. The two major groupings within the social-attitudinal life function are Social and Individual. The Social grouping incorporates those social-atttiudinal impairments which represent difficulties in relating to others--for example, problems of withdrawal and isolation; social incompetence; and anti-social behavior. The Individual grouping deals with impairments that essentially affect the self--i.e., disturbances of self-concept; pathological personality disturbances. There is, however, only a fine line of differentiation between these classes of problems. For example, problems in one's self-concept are often caused by concern over what the non-disabled's perception of the disabled individual is or will be. (see Table 3-13).

It appears that Individual social-attitudinal impairments are more numerous than Social social-attitudinal impairments. The individual grouping contains 58% of the total number of need statements and affects a large number of disabilities. Additionally, one of the categories within this grouping, Common Reactions to Disability and Treatment, contains 34% of the total number of need statements and affects all fourteen disability groups. While the problems noted within this category affect a large number of people and thus call for rehabilitative techniques to meet the disabled's need, it must be noted that these are the normal reactions of an individual after learning that he/she is disabled. These reactions are often of short duration, especially when effective psychotherapy is introduced as part of the treatment.

TABLE 3-13
SOCIAL ATTITUDINAL NEED STATEMENTS IN NEED CONSTELLATION "CLUSTERS" BY DISABILITY

		DISABILITIES															
		MOTOR			BEHAVIORAL			CHRONIC DISEASES						SENSES		TOTAL	NO. OF DISABILITY GROUPS
		ST	SCI	CP	MR	EP	SZ	RA	CHD	EM	CRC	KD	DM	HI	VI	%	ATTENDED
Social	1. Withdrawal & Isolation	X	X	X	X		X	X			X	X	X	X		10	11
	2. Social Incompetence	X	X	X	X		X	X		X		X	X	X	X	14	11
	3. Dependency & Dependency Conflicts	X	X		X	X	X	X				X		X	X	6	9
	4. Anti-Social Behavior & Attitudes	X	X	X	X	X		X			X	X	X	X	X	8	11
	5. Difficulty in Sexual Relationships		X		X	X	X					X				4	5
Individual	6. Disturbances of Self Concept	X	X		X	X	X	X	X	X	X	X		X	X	10	12
	7. Common Reactions to Disability & Treatment	X	X	X	X	X	X	X	X	X	X	X	X	X	X	34	14
	8. Pathological Personality Disturbances	X	X		X	X	X	X	X		X	X	X	X		14	11

100%

Total # of Need Statements 316

The behavioral disabilities have large numbers of social-attitudinal problems. This may be due to the stigmatization that has historically accompanied these three disabilities. Among the motor disabilities, the spinal cord injured and stroke victim have been found to have a large number of impairments. This may be due to the obvious physical visibility of their impairment and to the dependency state these individuals can potentially be reduced to.

Mobility. The two major groupings within the mobility life function are: Physiological Motor Difficulties and Difficulties in Performing Daily Activities and Negotiating Environments. Table 3-14 reveals that there are five categories within the physiological Motor Difficulties grouping and two categories contained in the second major grouping. These seven categories are on a more abstract level than the need constellations previously mentioned, but somewhat more specific than the two major groupings.

The first grouping has recorded within it specific physiological impairments, while the second grouping deals with mobility impairments which interface with the environment. It would appear that researchers have dealt with impairments on two levels of functioning. The statements in the first grouping fit neatly into the impairment level of analysis, while in the second grouping the statements deal not only with impairments but with handicapping factors. Quite frankly, it is impossible to assess the mobility needs of the disabled without discussing access to the environment and thus the role of the environment in determining handicap.

TABLE 3-14
MOBILITY NEED STATEMENTS IN NEED CONSTELLATION "CLUSTERS" BY DISABILITY

		DISABILITIES															
		MOTOR			BEHAVIORAL			CHRONIC DISEASES						SENSES		TOTAL	NO. OF DISABILITY GROUPS ATTENDED
		ST	SCI	CP	MR	EP	SZ	RA	CHD	EM	CRC	KD	DM	HI	VI	%	
Physiological Motor Difficulties	1. Paralysis & muscle tone	X	X	X		X	X	X				X				12	7
	2. Joints & Posture: Structural Involvement of Motor System	X		X	X			X				X				10	5
	3. Uncontrolled Movements and Hyperactivity	X	X	X	X	X	X	X				X				17	8
	4. Fine Motor Control & Kinesthetic & Tactile Perception	X	X	X	X	X	X	X						X	X	11	9
	5. Coordination & Balance	X	X	X	X	X	X					X		X	X	10	9
Difficulties in Performing Daily Activities & Negotiating Environments	6. Limitations in Ambulation & Physical Activities	X	X	X	X			X				X	X	X	X	12	9
	7. Limitations on Exertion, Mobility Outside the Home & Activities of Daily Life	X	X	X	X			X	X	X		X	X		X	28	10
																100%	
	Total # of Need Statements															221	

While 60% of the mobility problems were categorized as physiological in nature, a large number of the fourteen case study disabilities are affected by such problems as limitations in ambulation, mobility outside the home, and activities of daily life (see Table 3-14). Oftentimes non-physiologically based mobility problems are the result of society's inability to appreciate the mobility problems associated with various disabilities and the existence of environmental barriers to mobility.

Those disabilities grouped within the motor disabilities category have numerous problems in both major mobility groupings. For example, within all three disability groups, individuals face difficulties in navigating through their environment and caring for their personal needs.

Persons within the sensory disability group are also limited in both major mobility groupings. However these persons are not as severely limited as individuals with motor disabilities in the physiological grouping. Problems in the physiological area relate to coordination and balance; fine motor control; and kinesthetic and tactile perception. These types of mobility problems are directly related to sensory organ impairments. Difficulties in moving about the environment are also present, especially for the more severely hearing and visually disabled.

Individuals with behavioral disabilities have a great number of physiological difficulties but only a limited number of environmental mobility difficulties, while individuals with chronic diseases, except for those with rheumatoid arthritis and kidney disease, have few mobility problems once their disability is brought under control.

Cognitive-intellectual Functioning. The cognitive-intellectual life function has been grouped into five general categories. These categories are more inclusive than the need constellation categories and therefore somewhat more abstract. However, these groupings indicate certain patterns in the cognitive-intellectual need statements. First, cognitive-intellectual impairments do not affect large numbers of the disability groups. The largest number of disabilities affected in a specific category is nine, in the Reasoning and Thought Processing category. It should be noted, however, that the smallest number of disabilities represented in any one category is seven, not an extremely low number. In terms of numbers of need statements identified in the literature, the greatest needs overall are in the areas of: (1) Reasoning and Thought Processing; (2) General Intellectual Functioning; and (3) Perceptual Functioning (see Table 3-15).

The behavioral disabilities are highly vulnerable to cognitive-intellectual impairment, while the sensory disabilities and the motor disabilities, with the exception of spinal cord injury, run a close second. Persons with chronic diseases are, for the most part, unaffected by cognitive-intellectual problems.

Communication. The communication life function (see Table 3-16) was compressed into five categories:

hearing
sight

TABLE 3-15
COGNITIVE-INTELLECTUAL NEED STATEMENTS IN NEED CONSTELLATION "CLUSTERS" BY DISABILITY

	DISABILITIES															
	MOTOR			BEHAVIORAL			CHRONIC DISEASES						SENSES		PERCENT OF	NO. OF DISABILITY GROUPS AFFECTED
	ST	SCI	CP	MP	EP	SZ	RA	CHD	EM	CRC	KD	DM	HI	VI	STATEMENTS	
1. Deficits in General Measured Intellectual Functioning			X	X	X	X					X		X	X	22	7
2. Deficits in Perceptual Functioning	X		X	X	X	X						X	X		22	7
3. Deficits in Memory Functioning	X			X	X	X			X		X		X	X	12	8
4. Deficits in Learning Functioning	X			X	X	X			X	X			X		14	7
5. Deficits in Reasoning & Thought Processing Functioning	X		X	X	X	X					X	X	X	X	30	9
															100%	

Total # of Need Statements 147

TABLE 3-16
COMMUNICATION NEED STATEMENTS IN NEED CONSTELLATION "CLUSTERS" BY DISABILITY

		DISABILITIES															
		MOTOR			BEHAVIORAL			CHRONIC DISEASES						SENSES		TOTAL	NO. OF DISABILITY GROUPS AFFECTED
		ST	SCI	CP	MR	EP	SZ	RA	CHD	EM	CRC	KD	DM	HI	VI	%	
Receptive	1. Hearing	X		X	X	X	X							X		20	6
	2. Sight	X		X	X	X	X	X				X	X	X	X	36	10
	3. Sensory Processing Problems Other than Sight and Hearing			X	X	X	X							X		5	5
Expressive	4. Writing & Other Expressive Comm. Modes	X					X							X	X	3	4
	5. Speech & Language Skills	X		X	X	X	X							X	X	36	8
																100%	
															Total # of Need Statements	152	

other sensory processing problems
writing and other expressive communication modes
speech and language skills

The first three categories from the Receptive grouping; while the latter two are contained within the Expressive grouping. The majority of the impairments (61%) are in the receptive grouping, with the remaining percentage (39%) in the expressive grouping. Thus, among the disability groups studied, there are more problems in receiving input than in sending output. While techniques must be developed to deal with both receptive and expressive aspects of communication, if one does not receive the correct signals, one cannot hope to interpret the environment correctly. Therefore, it is not just a matter of developing techniques for the disabled person to express himself/herself; techniques must be developed which permit a disabled individual to receive input.

Visual impairments appear to affect the largest number of disabilities (10). Impairments in this area also account for a large number of communication need problems overall. Thirty-six percent of the total number of communication need statements detected fall within the sight category. This evidence might be interpreted as supportive of the contention that visually impaired individuals are more handicapped by their disability than hearing impaired individuals are by theirs.

Within the expressive grouping, the largest number of need statements, as well as disability groups affected, is in the speech and language skills area. Since oral communication has become the "medium for the message," with a resultant decline in written communication, speech and language skill impairments result in significant handicaps for a disabled individual.

A further qualification must be made: Although this communication life function has relatively few need statements, one must not view these impairments as inconsequential. The inability to receive and send information is an extremely severe handicap for the social animal called man.

Multiple Accounting: Interrelationship Among Disability Groups

An analysis of the Life Function need statements revealed that twelve of the fourteen case study disabilities are related to at least one of the other case study disabilities. Though strengths of relationships were not always reported, it was possible to determine which secondary disabilities occurred at above average rates within each of the case study disability groups. Table 3-17 lists the number of secondary impairments associated with various case study disabilities. Reading down, one can see, for each primary disability, the secondary impairments reported in the literature; reading across rows, one sees the extent to which each disability appears as a secondary impairment in other disabled groups.

There are a number of case study disabilities which do not appear to develop many secondary impairments--coronary heart disease, stroke, cancer of the colon/rectum, spinal cord injury, and schizophrenia. A number of factors contribute to this phenomenon. Both stroke and coronary heart disease have acute onsets and are

TABLE 3-17

INTERRELATIONSHIPS AMONG DISABILITY GROUPS

		CASE STUDY DISABILITIES													
		MR	CP	EP	HI	VI	CHD	CRC	SZ	ST	SCI	KD	RA	DM	EM
SECONDARY IMPAIRMENTS	MR	-	MR	MR	MR				MR						
	CP	CP	-		CP										
	EP	EP	EP	-								EP			
	HI	HI	HI		-										
	VI	VI	VI		VI	-				VI		VI		VI	
	CHD	CHD		CHD	CHD	CHD	-					CHD	CHD	CHD	CHD
	CRC							-							
	SZ			SZ	SZ				-				SZ		
	ST									-					
	SCI										-		SCI		
	KD			KD							KD	-		KD	
	RA											RA	-		
	DM					DM						DM		-	
	EM														-

ABBREVIATIONS FOR THE FOURTEEN CASE STUDY DISABILITIES

MR = Mental Retardation
CP = Cerebral Palsy
EP = Epilepsy
HI = Hearing Impairment

VI = Visual Impairment
CHD = Coronary Heart Disease
CRC = Colon/Rectum Cancer
SZ = Schizophrenia
ST = Stroke

SCI = Spinal Cord Injury
KD = Kidney Disease
RA = Rheumatoid Arthritis
DM = Diabetes Mellitus
EM = Emphysema

controllable by the cessation of risk factor behaviors. No case study disabilities are listed as secondary impairments of coronary heart disease victims, while stroke victims suffer from only one other case study disability, visual impairment.

Two other case study disabilities with acute onset are spinal cord injury and cancer of the colon/rectum. In the case of colon/rectum cancer, if the carcinoma is completely removed, the remaining impairments are essentially psychological rather than physiological--for example, adjustment to apparatus, familial adjustment, and re-entry into society and the labor force. The cancer is no longer a causative disease agent, and other disabilities do not appear to develop. If the cancer is not completely removed, death is the usual result.

In the case of spinal cord injuries, there are a number of physiological impairments; however, only one is a case study disability--kidney disease or , in the extreme, uremia.

Schizophrenia, a mental and behavioral disorder, is not a physiological disorder itself and is not associated with other physiological impairments. Mental retardation, which is itself a mental disorder, is the only case study disability considered to be a significant secondary impairment.

The remaining four disabilities--kidney disease, rheumatoid arthritis, diabetes mellitus and emphysema--exhibit a wide range of case study disabilities as secondary impairments. Kidney disease has the largest number (five), with rheumatoid arthritis and diabetes mellitus both having three and emphysema only one.

In the case of kidney disease, a number of these impairments result from treatments and therapies. For example, arthritis often occurs in renal transplant patients, while petit mal seizures sometimes result when renal failure patients receive large doses of penicillin.

The secondary impairments associated with diabetes mellitus usually occur in patients who have had the disease for a number of years. Any disease of long duration will quite often adversely affect other body systems due to the natural interdependency among body parts. This is especially true of diabetes mellitus.

Finally, rheumatoid arthritis has three disabilities listed as secondary impairments, while emphysema has one, coronary heart disease.

In summary, the technology assessment team has found sufficient evidence to indicate that the case study disabilities often occur together as multiple debilitating conditions. Many of these disabilities have four or five disabilities listed as secondary impairments. These associations are extremely strong among the developmental disabilities (mental retardation, epilepsy, cerebral palsy), and extremely weak in disabilities in which: (1) onset is acute; (2) patients maintain positive health behaviors during and after treatment; and/or (3) functioning of a bodily system interrelated with other systems is not impaired.

Although the previous literature has focused some attention on the extent to which children are multiply disabled, very little has been done to ferret out the relationships of disabilities to one another. This task is not an idle exercise. In the first place, accurate estimates of the size of disabled target populations cannot be obtained if multiply handicapped persons are counted twice or, by error in the opposite direction, counted only once. What would be needed is a standardized accounting system which counts, for example, persons with kidney disease only, persons with kidney disease and coronary heart disease, persons with kidney disease, coronary heart disease, and visual impairment, and so on through all combinations. Such an accounting system would provide far more information about the needs of the multiply handicapped population than is presently available.

Technological Causes of Life Function Needs

Just as the needs of the disabled are often rooted in or aggravated by characteristics of the physical and social environment, the rehabilitation technologies applied to the disabled often have their own adverse effects on the disabled. Without going into a full analysis of this phenomenon here, we will illustrate through three examples the nature of the problem.

For persons with end-stage renal failure, the alternatives are limited: dialysis, transplant, or death. Any needs arising from treatment are undoubtedly easier to bear than death, but the fact remains that several life function needs are attributable to the technology itself. In the health life function area, dialysis may cause the following: intense itching, susceptibility to infections, peripheral neuropathy, joint complications, bone disease, impotence, strange taste sensations, pain associated with the cannula implanted for dialysis, and sleep disturbance. Adrenocorticosteroid therapy applied to kidney disease patients carries with it a comparably broad set of negative side effects. In the cognitive-intellectual area, disequilibrium associated with being dialyzed too fast and too long may progress to seizures and mental confusion, and delirious reactions have been noted during or after dialysis. In the area of mobility, the patient is immobilized for a time after installation of a leg shunt; must avoid excessive movement of the cannulated limb; must keep the shunt, if it is used, completely dry and so must avoid water activities; and must limit social activities and travel in order to receive regular dialysis. Finally, dialysis affects social-attitudinal functioning, causing depression, anxiety associated with lack of confidence in the equipment, irritability, negativism, aggressiveness, body image confusion, and many other reactions, including suicide in rare cases.

For the person with cancer of the colon or rectum, the choices are again difficult: colostomy or death. Once the colostomy operation is performed, the patient faces a variety of difficulties in adjusting to the life of managing a colostomy. Although one disabled woman interviewed in conjunction with the study claimed that one can wear a bikini despite the stoma or waste bag, problems include the following: uncontrolled bowel movements until the patient learns to manage the colostomy; odor due to discharge of waste materials and fear of the embarrassing effects of odor; pain; impotence; loss of pleasurable sensation during intercourse; and a wide range of psychological reactions. Although some problems can be solved once the requirements of the colostomy are mastered, others are continuing aggravations or impairments.

Finally, the case of epilepsy might be mentioned, for many of the problems of the epileptic are attributable to anticonvulsant drugs--such symptoms as fatigue, nausea, skin rashes, anemia, nephrosis, hyperventilation, mental confusion, diminshed muscle tone, ataxia, dizziness, and so on, almost without end. A very sizable number of the life function needs for epileptics appear to be tied to the drugs used in treatment, each of them with its own constellation of adverse side effects. Although again, the epileptic has few choices, one must raise questions about the state of rehabilitation technology when it almost creates more impairments than it alleviates.

Perspectives of Disabled Persons

In conjunction with the technology assessment project, students in rehabilitation counseling interviewed disabled persons and service deliverers in Lubbock, Texas. For the students, it was an opportunity to test out concepts presented in a course on Psychological Aspects of Disability and learn first-hand about the experiences of disabled persons. For the technology assessment team, it provided a modest check on the validity of the life functions analysis.

Table 3-18 is based on a content analysis and classification of statements made by 16 disabled persons, two from each of eight of the case study disabilities. Needs expressed throughout the loosely structured interviews were categorized by life function. Table 3-18 indicates the percentage of statements which fell in each of the five life functions for each group. The number of statements ranged from seven to twenty statements per disability group.

In some respects, the statements by disabled respondents coincided with the analysis of the published literature presented above. Some of the same statements appeared in both places. Mobility problems were obviously of high salience to the paralysis-motor control group--stroke victims, the spinal cord injured, and the cerebral palsied--though they were also mentioned frequently by other groups, such as rheumatoid arthritics, whose mobility needs were reflected in the literature. However, it is also apparent that the disabled respondents did not discuss health needs to nearly the extent that the literature does. Instead, the disabled focused on problems in daily activities, reflected in the mobility life function, and problems associated with interpersonal relationships, reflected in the abundance of social-attitudinal life function statements.

The disabled talked about the mundane, but not unimportant, difficulties in performing everyday tasks which are seldomly discussed in the literature on disability. Arthritic respondents had trouble taking care of their hair, opening jars and car doors,

TABLE 3-18

DISTRIBUTIONS OF LIFE FUNCTION NEEDS BASED ON STATEMENTS BY 16 DISABLED PERSONS (IN PERCENTS)

		DISABILITY GROUP							
		SI	SCI	CP	RA	CHD	KD	DM	VI
LIFE FUNCTIONS	HEALTH		7			22	40	14	
	SOCIAL-ATTITUDINAL	43	38	43	48	45	40	86	62
	MOBILITY	57	54	43	52	33	10		32
	COGNITIVE-INTELLECTUAL								
	COMMUNICATION			14					6
Total Number of Statements for Each Disability		7	13	7	20	9	10	7	14

Percentage of Statements in each Life Function.

and riding on escalators. One could not sing in the choir due to the requirements for rising and sitting during the service; one was embarrassed by her inability to shake hands; another noted that housecleaning was problematic since vacuuming took a long time and she could only dust the tops of furniture. For the spinal cord injured, problems included opening doors, opening cans, and in the case of a student teacher, reaching the blackboard in the classroom. A very competent blind woman still expressed irritation at her difficulties in polishing her nails, cutting meats and pies, and buying and selecting clothes.

However, it was not always just the limitation itself which caused concern; it was often the potential embarrassment of displaying one's limitations, the fear of what others would think. The woman who could not shake hands was bothered primarily because she perceived her inability as an interference in social interactions. A blind woman training to be a social worker was concerned about making others nervous when she had to open and close her watch to read the time, and she suspected that she would have difficulties relating to clients due to her inability to use eye contact as a tool of communication and read the body language of others. She was also embarrassed by how she looked when eating pizza--a need statement which we are certain did not appear in the published literature.

Their concern was not unfounded, for they also mentioned several behaviors and attitudes on the part of others which bothered them. A heart disease victim resented it when others minimized the seriousness of her condition. On the other hand, a stroke victim was irritated when people stared. Several respondents were upset by pitying attitudes, overprotection, and overly solicitous help. They were frustrated by their dependence on family members in performing activities. A blind respondent hated to impose on friends for rides unless the trip was essential; a diabetic was annoyed by others trying to do too much for her; a kidney patient on dialysis felt guilty because his restrictions on travel affected his wife as well.

A blind respondent expressed it best. On the one hand, people pitied her, praised her for inadequate work because they felt sorry for her, and held low expectations about what she could do for herself. At the other extreme, some fell into what she termed the "Helen Keller-Longstreet syndrome," believing that she, as a blind person, must have almost supernatural powers. All that she wanted was to be treated like a regular person, neither frail nor omnipotent.

On the basis of a few interviews, it is not possible to discover the perspective of the disabled. We found large differences from individual to individual--for example, one cerebral palsied respondent defeated, bitter, and self-pitying while the other was outgoing and aggressive in seeking a place in the world. When asked to give advice to new rehabilitation professionals, however, most said, "Get to know disabled people as people, don't just assume you know their needs."

MEMBERSHIP IN THE LABOR FORCE

The purposes of this section are: (1) to describe major problems related to employment of the handicapped based on Census data and case study disability reports; (2) to examine the relationship of Vocational Rehabilitation of the disabled to membership in the labor force; and (3) to review recent legislation affecting membership in the labor force.

Information from the Census

According to findings of the 1970 Census, the unemployment rate of the handicapped was about the same as the general unemployment rate in the U.S.--around 5%. These data, however, are based only on those members of the handicapped population who are considered to be part of the labor force--that is, working or actively seeking employment. When compared to the nonhandicapped, a far greater proportion of the handicapped are not in the labor force. The 1970 Census indicated that while 59 percent of the total population (both male and female) is employed, only 42% of the handicapped population is employed. Figures based on the civilian labor force indicate that 89.9% of the partially disabled are working at full or part-time jobs. It is also estimated that 3.6% of the partially disabled and 17.5% of the completely disabled have never worked, compared to 6% of the nondisabled population (President's Committee on Employment of the Handicapped, 1975). Handicapped women appear to be at a special disadvantage. Fifty-eight percent of handicapped males are employed, compared to 76% of all males, but only 24% of handicapped women are employed, compared with 42% of all women.

Presumably, among those not in the labor force, some are not working or seeking work by choice. Others are students and housewives, and many are too severely handicapped to seek employment. The actual number of handicapped individuals who fall into these categories is unknown. It must be assumed, however, that many are kept out of the labor market by architectural, transportational, and attitudinal barriers of society, rather than solely by the nature of their disabilities (President's Committee on Employment of the Handicapped, 1975).

Many studies have shown a preponderance of disabled individuals working at unskilled jobs. In part, this is due to the concentration of many disabling conditions in the lower socioeconomic classes and to limited work capacity attributable to functional limitation. However, it has also been found that many of the disabled are underemployed--that is, working at jobs which are not congruous with their level of education, training, and potential. Given this situation, it is not surprising that the disabled have had lower incomes than the nondisabled. According to 1970 Census figures, 52% of people defined as disabled have incomes below $5,200 per year. Six percent more handicapped than nonhandicapped persons had incomes below $2,000 annually. Seven percent fewer handicapped than nonhandicapped had earnings above $7,000 per year. The difference in income is accentuated when handicapped and nonhandicapped males are compared: 14% fewer handicapped than nonhandicapped men had earnings of $7,000 or more. Employment rates for the handicapped in the $7,000 and below range appear to compare favorably with those for the nonhandicapped. However, the $7,000-a-year income mark seems to be difficult for the handicapped population as a whole to surpass, suggesting that they have difficulty moving ahead to better jobs paying better money (President's Committee on Employment of the Handicapped, 1975).

Case Study Disability Findings

In a review of the case study disabilities with respect to their participation in the labor force, several vocational problems and obstacles to the disabled person's vocational success emerged:

1. Lack of membership in the labor force. Many of the disabled are not presently working, have never worked, and are not actively seeking work. For example, the President's Committee on Employment of the Handicapped (1967) found that of 200,000 cerebral palsied individuals of working age, only a handful were employed. Other sources have estimated that over 50% of young cerebral palsied adults need sheltered workshop employment, and that 60-70% are marginal workers without the capacity for regular employment (Moed & Litwin, 1962). Another study found that less than one-half of cerebral palsied adults screened for employment were judged to have vocational potential (Machek, Hardin &

Collins, 1963). For severely and profoundly retarded persons, as well as for some severely physically disabled persons, low employability is often a function of performance deficits associated with the disability itself.

2. Restrictions in range of vocational activity. While some disabled persons have no marketable job skills, others can no longer use skills which they had before disablement and must be rehabilitated to perform other jobs. For the arthritic, limitations in types of work possible often rule out jobs requiring hand and arm activities, standing, walking, climbing, and lifting. Most victims of rheumatoid arthritis who return to work must change the nature of their work, in many cases to a lower paying position (Anderson, et al., 1962.)

Other disabled individuals must control their schedules or diets and thus are no longer good candidates for certain types of jobs. The diabetic taking insulin, for example, must modify work habits by maintaining a routine meal schedule, limiting variation from day to day in physical exertion, and working with a group rather than alone (Oakley, et al., 1973). The majority of diabetics are employable and employed, although approximately 562,000 diabetics are limited in their ability to work, keep house, or engage in scholastic activity. Of this number, approximately 30% are entirely unable to perform their major activity and 6% are confined to their homes and are unable to move about without difficulty (National Health Interview Survey, 1967).

While the vast majority of coronary heart disease patients will be symptom free and able to work effectively between the first attack and death or retirement, some cannot return to jobs which are physically or emotionally stressful. Heart disease patients are limited to more sedentary types of jobs, particularly at first (Dimond, 1963).

Other factors influencing the disabled's participation in the labor force include limitations in the social-attitudinal life function. Often these are environmentally imposed. Some disabled persons in virtually all disability groups have learned to be dependent due to societal attitudes which underestimate their potential, as well as to architectural and transportational barriers which inhibit the development of independent modes of behavior. Motivation and emotional stability as they relate to work behavior can likewise be socially influenced. Some disabled individuals, for example, the schizophrenic, may experience difficulty relating effectively to coworkers and supervisors or have other emotional problems and personality disorders which interfere with obtaining and maintaining jobs, even when the requirements of the work are well within their capabilities. The Institute Treatment Center Study (reported in Davis, et al., 1974) found that between 16 and 29% of their sample of schizophrenic outpatients had lost jobs because of emotional episodes, interpersonal trouble with coworkers, or poor job performance related to their mental problems.

3. High unemployment rates. For nearly all of the case study disabilities groups, the rate of unemployment among those individuals in the labor force is consistently higher than that of the general population.

For example, while the mildly mentally retarded adult can generally be expected to perform well at unskilled or semi-skilled jobs, Conley (1973) reports that only 87% of mildly retarded males and 33% of mildly retarded females have been employed at one time or another, percentages which are below the norm for the nonretarded. Employment potential diminishes with decreasing IQ, but recent evidence indicates that the severely retarded can be trained to do complicated assembly tasks. The retarded generally compete for the kinds of jobs which automation would be expected to eliminate, but some researchers argue that the assembly line style of simple repetitive maneuvers broadens, if anything, the opportunities of the mentally retarded worker.

While there is apparently no relationship between the stage of rheumatoid arthritis and employability, high unemployment rates, approximately 25-30%, have been reported for the arthritic population (Duthie, et al., 1964; Ragan & Farrington, 1962; Manheimer & Benton, 1960). Unemployment rates for epileptics are also extremely high compared to overall U.S. rates. The rate has been estimated as being between 20 and 25% (The Epilepsy Foundation of America, 1975).

Rate of employment after release from a mental hospital is reportedly very low, though studies tend to conflict. The Institute Treatment Center study (reported in Davis, et al., 1974) found that 75% of the subjects had never established an occupation. Between 23% and 39% of the male subjects were welfare recipients, claiming compensation on the basis of mental disability. Another 13% to 22% were considered too sick to work by their families, and approximately the same percentages were reported as not being able to find a job.

Employability of the spinal cord injured has increased dramatically in recent years due to advances in treatment and a shift in focus from insuring survival to offering rehabilitation. Estimates of the percents of those employed after discharge from rehabilitation hospitals and spinal cord centers suggest that 30-60% are employed; others are in school or training (Dvonch, 1965; Young, 1972; Runge, 1966).

Employment possibilities after myocardial infarction appear to be high. Eighty to 90% of those who experience uncomplicated infarctions and survive for one year return to work, three-fourths of them to their old jobs. Highest chances for return, however, are for younger workers with least impairment (National Heart and Lung Institute, 1974). Of an estimated 35,000 who lose their sight each year, 25% have excellent chances for competitive employment (The National Society for the Prevention of Blindness, 1966).

Of the case study disabilities, the hearing impaired population project the best employment picture. Approximately the same percentages of the deaf as of the general population are in the labor force. Percents for the deaf are slightly higher, though this is accounted for by differences in age-sex-race compositions (Schein & Delk, 1974).

4. Early retirement and premature death. Due to the nature of associated impairments, as well as the fact that many disabling conditions tend to strike the older population, many disabled individuals retire or leave the labor force prematurely. Since emphysema, for example, strikes primarily males in their fifties and sixties, it tends to cause a restriction of occupational activities and may cause early retirement in its later stages. The laborer or skilled worker faces greater problems than the white collar worker due to the need either to change the nature of his job to one which is more sedentary or to retire early (National Tuberculosis and Respiratory Disease Association, 1972). Among victims of coronary heart disease, some patients tend to retire earlier by choice or because of loss of seniority or retirement years. Others are at a disadvantage if they work in a competitive field and were out of work during convalescence.

More rarely, disability may result in premature death of an employee. Kidney disease, for example, is unlike most chronic diseases in that it is particularly likely to cause death in patients in the middle and most productive years (Goodman, 1969).

The stroke victim is often subject to death or early retirement after returning to work, and since stroke tends to strike older members of the labor force, many never attempt to return to work. One study found that somewhat fewer than half returned to work, and among those that did, the attrition rate during a five-year period was far higher than the rate for all males in the company studied (Ladd, 1962).

5. Insurance Practices/Workmen's Compensation Laws. Often insurance practices discourage employers from hiring disabled persons, even when the insurance risk is not significantly higher for the disabled group. Epileptics, for example, are seen as a risk to employers with respect to insurance and Workmen's Compensation costs, even though seizures may affect only a few hours or days in a year and even though premium rates are based on accident rates, which are not disproportionately high for persons with epilepsy. (Epilepsy of America, 1975).

Industry also often refuses to hire people with heart disease because Workmen's Compensation laws generally rule that heart attacks are caused by the job and are therefore compensable (Rubin, *et al.*, 1972).

For the epileptic, diabetic, or coronary patient, episodic attacks can occasionally disrupt job activities and result in injury to self or coworkers and/or inefficiency in productivity. Due to the fear of such attacks, many employers either (1) limit the occupations open to the disabled individual, or (2) refuse to hire the disabled.

The New York Central Railroad adopted a policy of returning operating personnel to full term work after a myocardial infarction if the employee was cleared for work by an internist. Of this group, approximately 5% of the men who returned to work were subject to another heart attack annually during the first five years, half of which were fatal. Since a majority of these fatal attacks occurred suddenly, the deaths of these workers suggested the practice of not returning a person who has experienced a heart attack to a job where his sudden death could cause harm or death to other people (Dimond, 1965).

Occupations in which hypoglycemic attack would be disastrous--airline pilot, bus driver, window cleaner, or an operator of dangerous machinery--are usually closed to the diabetic (Oakley, 1973). Cancer and kidney disease patients may also be excluded from jobs in many companies because they are considered too costly to insure (Cooke, personal interview).

6. Employers' misconceptions of disability groups and negative attitudes. Misconceptions of the potential of the disabled worker and stereotyped opinions and attitudes toward the disabled constitute serious obstacles to entrance in the labor force and employment. Although negative attitudes are sometimes based on objective evidence of limited capacity, this is not typically the case. In a study of employer assessments of the desirability of various groups as employees, Colbert, Kalish, and Chang (1973) found that persons with physical and sensory disabilities were preferred over

those with behavioral disabilities. Of the case study disabilities included, the order of desirability to employers, from most to least desirable, was: heart disease, deaf, cancer patients, blind, mentally retarded, and mentally ill. All of these groups were less desirable than blacks, welfare recipients, old people, and the "cripple," and the desirability of the mentally retarded and mentally ill was comparable to that of the lowest ranked groups--alcoholics, student militants, and the drug addicted. In another study, Rickard, Triandis, and Patterson (1963) found the following order of preference for persons to be considered for accountant positions: tuberculosis, wheelchair, deaf, mental patient, ex-prisoner, and epileptic. Epilepsy is a prime example that functional capacity is not limited. Epileptics are often compelled to conceal their condition from employers. One study (EFA, 1975) found that over half of the sample reported experiencing difficulties obtaining employment, and 30% attributed the problem to negative employer attitudes. Many lose jobs because of seizures or live in fear of discharge. These attitudes persist despite the fact that if fully controlled by anticonvulsants, a person with epilepsy can undertake virtually any occupation except driving public transportation. The individual who experiences occasional attacks may need to avoid jobs involving electricity, machinery, heights, or any job in which a seizure would present potential danger to self or others. The employee with epilepsy has been found to be, contrary to employers' myths, above average in attendance and motivation and below average in lost time and accident rates (Epilepsy Foundation of America, 1975).

While the deaf and hearing impaired are employed in all the principal occupations from domestic worker to professional, a number of studies have found that employers are reluctant to hire deaf workers (Rickard, Triandis, & Patterson, 1963; Williams, 1972), and others have indicated that employers frequently hold stereotypical views of the deaf (Phillips, 1973).

The major implication of this evidence is that employers need more accurate information about the vocational performance of the handicapped so that they perceive hiring handicapped workers as an economic benefit rather than a philanthropic duty, or worse, an economic liability. Qualification for the job is not currently the major criterion for hiring.

7. Underemployment/Underpayment. Among the disabled who are employed, underpayment and underemployment are pervasive problems. The mentally retarded, who are primarily employed in unskilled jobs, reportedly earn approximately 85% of that received by nonretarded persons for similar work (Conley, 1973). While there are no indications that the spinal cord injured are inferior as employees, many are underemployed or underpaid. Without financial, educational, and family support, they may end up working in workshops below their capacities and at minimal or subminimal wages.

Other disability groups are notably concentrated in lower level occupations. Moed and Litwin (1963) have reported on a study of cerebral palsied young adults. Of those subjects who were employed at the time, approximately half held unskilled jobs and one-fourth were clerical workers. Sometimes underemployment is attributable to learned dependency and low self-concept. Several authors have suggested that these are primary obstacles to employment of the blind, and, as a result, they tend to be concentrated in lower-level occupations, although they are capable of performing at all levels, including professional and managerial.

Evidence of underemployment of the hearing impaired has been reported by Schein and Delk (1974). Most notably, they reported an average of 10.2 years of education among the deaf employed as service and household workers.

8. The governmental system of disability payments. Disability benefits and maintenance payments often constitute environmental obstacles to employment of the handicapped by making it essentially self-defeating for some disabled persons to attempt to find work. This problem affects a large proportion of the disabled and is quite evident in the requirements of no income or little income for persons desiring free dialysis care or the risks to a developmentally disabled adult who finds work, loses work through no fault of his own, and finds in the meantime that his Supplemental Security Income (SSI) benefits cannot be

reinstated. For the cardiac patient, Workmen's Compensation and Social Security Benefits sometimes act as discentives to full recovery, in that compensation benefits often depend on the extent of disability (National Heart & Lung Institute, 1974; Rubin, et al., 1972).

Loss of disability benefits is especially debilitating for the severely physically disabled, such as the spinal cord injured. Low pay, underemployment and lack of full employment are vocational problems the spinal cord injured individual often experiences. These individuals must also spend a relatively large portion of their incomes in the acquisition of special services such as transportation, housekeeping, and attendant care. The loss of an income supplement, combined with low wages, can often result in decreased independent functioning.

9. The unavailability of or lack of access to vocational training and counseling services. This is mentioned repeatedly in the literature as a need for many groups. Although vocational rehabilitation priority on the severely handicapped should open new opportunities, progress toward its realization will be slow and will not in itself solve the need for longer term, more intensive vocational services. Nor will the vocational rehabilitation system be able to handle all of the needs for personal-social adjustment training and counseling requisite for adequate work adjustment.

Vocational Rehabilitation and Labor Force Participation

Table 3-19 indicates for several different case study disabilities rehabilitation ratios which are obtained by dividing the number rehabilitated by the number not rehabilitated. This excludes cases "Closed from Applicant Status," i.e., persons who applied but who were subsequently judged infeasible or ineligible, or who for reasons unrelated to their disability status did not actually receive rehabilitation services. The higher the rehabilitation ratio, the easier it was to successfully rehabilitate members of the group. This table was presented by Schein (1973) to illustrate several points about the hearing impaired. Specifically, it can be noted that although hearing impairments are more prevalent than visual impairments, rehabilitation agencies are more involved in service to the visually impaired. Within both the visual and hearing impairment categories, it was easier to rehabilitate those with lesser impairments than those with severe impairments. Overall, both groups were relatively successfully rehabilitated, whereas mentally retarded, mentally ill, and epileptic clients were among the more difficult cases. Although, not all of the case study disabilities are distinguishable in this table, it suggests (1) that numbers served by vocational rehabilitation agencies do not always reflect numbers of disabled adults in the population; and (2) that rehabilitation agencies are successful to varying degrees with different disability groups.

The Urban Institute (1975) comprehensive needs study shed further light on the role of vocational rehabilitation agencies

NUMBER AND PERCENT DISTRIBUTION OF STATE UR CLIENTS BY SELECTED MAJOR DISABLING CONDITIONS AND REHABILITATION STATUS FY 1970

Major disabling condition	Closed from applicant status		Rehabilitated		Not Rehabilitated		Rehabilitation Ratio
	Number	%	Number	%	Number	%	
All disabilities	132,530	100.0	256,544	100.0	72,921	100.0	3.52
Hearing impairments	4,074	3.1	14,334	5.6	1,745	2.4	8.21
Deafness	1,595	1.2	5,915	2.3	967	1.3	6.12
Unable to talk	665	0.5	2,123	0.8	462	0.6	4.60
Able to talk	930	0.7	3,792	1.5	505	0.7	7.51
Other hearing impairments	2,479	1.9	8,419	3.3	778	1.1	10.82
Visual impairments	11,118	8.4	22,420	8.7	3,861	5.3	5.81
Blindness, both eyes	2,569	1.9	7,364	2.9	1.545	2.1	4.77
Other visual impairments	8,549	6.5	15,056	5.9	2,316	3.2	6.50
Orthopedic impairments	30,194	22.8	45,688	17.8	14,156	19.4	3.23
Absence/amputation of extremities	2,090	1.6	9,520	3.7	1,723	2.4	5.53
Mental illness	38,635	39.2	63,267	24.7	29,448	40.4	2.15
Mental retardation	10,037	7.6	30,356	11.8	7,629	10.5	3.98
Benign/unspecified neoplasms	410	0.3	2,447	1.0	218	0.3	11.22
Allergies	2,287	1.7	2,437	1.0	573	0.8	4.25
Endocrine disorders	2,228	1.7	4,105	1.6	860	1.2	4.77
Epilepsy	3,012	2.3	4,267	1.7	1,487	2.0	2.87

Source: Schein, 1973

in providing services to the severely handicapped. The study found that 68,000 persons were denied services or closed for reasons of severity in 1972. In interviews with 889 such physically disabled persons, it was found that relatively few were highly dependent in daily functioning. Based on the results of the Barthel Index, a checklist of self-care and mobility functions, 45% were completely independent, 14% slightly dependent, 30% moderately dependent, and only 11% severely or totally dependent. As suggested in the present analysis, there was only a slight relationship between diagnostic label and severity of handicap. Of the persons who were functionally independent or only slightly dependent, 46% were presently working, had worked recently, or wanted to work. The Urban Institute study was done at the time the new priority on serving the severely handicapped was enacted into law. It is difficult to project how this picture might change in the future, but the Urban Institute study suggests that there is a great deal which can be done to serve those persons previously judged as too severely disabled for services. However, the state vocational rehabilitation agency is only a small part of the service delivery system; according to the Urban Institute report, vocational rehabilitation accounts for only 2% of federal expenditures on the severely disabled.

Legislation Affecting Participation in the Labor Force

The federal government has recently taken action to eliminate discrimination against disabled individuals in employment. The

Wagner-Peyser Act requires the U.S. Employment Service to develop a national system of employment offices providing counseling and placement services for handicapped persons. Federal agencies and federal contractors are also required to take affirmative action in hiring and promoting qualified disabled individuals. Under the provisions of the Rehabilitation Act of 1973, for example, each federal agency must submit to the Civil Service Commission an affirmative action program for the hiring and placement of handicapped workers. All employers whose businesses have federal contracts in excess of $2,500 must also take affirmative action with regard to the hiring and advancement of the handicapped. Additionally, the Wagner-O'Day Act (P.L. 92-28) established that sheltered workshops serving the blind and severely handicapped persons receive special preference in bidding on government contracts for products and services. Once a bid is accepted at least 75% of the direct labor involved in making the product or providing the service must involve blind or severely handicapped individuals. In the event of violation of these requirements, a disabled individual may file a complaint with the Department of Labor, which is required to investigate the complaint "promptly" (The President's Committee on Employment of the Handicapped, undated).

With regard to employment of the handicapped within the federal service, the Rehabilitation Act of 1973 established an Interagency Committee on Employment of the Handicapped whose purpose is to review the adequacy of existing placement, hiring, and advancement practices.

A few of the states, Maryland and Virginia in particular, have passed laws prohibiting discrimination against the disabled by both state and private employers. Most of these statutes apply only if a handicap or impairment is unrelated to ability to perform the position for which the individual is applying. These anti-discrimination laws cover hiring practices and terms, conditions and privileges associated with employment. Penalities for violation of these laws range from imprisonment and/or fines in the District of Columbia to removal of the person responsible for the act of discrimination in Maryland. Maryland also has a law which prohibits discrimination against physically and mentally handicapped individuals by labor organizations (The President's Committee on Employment of the Handicapped, undated).

The Fair Labor Standards Act of 1966 guarantees the right to be compensated for work to all citizens. In 1973, the United States Department of Justice issued regulations on the application of this Act to persons in institutions for the mentally retarded. Minimum wage and hour regulations established by the Act also apply to patient workers in state institutions for the mentally ill. A resident of such an institution must be compensated for work that is considered non-therapeutic or work that would otherwise be performed by a non-patient worker (President's Committee on Employment of the Handicapped, undated).

Under certain circumstances, employers and agencies (both private and public) are authorized to pay less than the minimum wage to persons who are impaired by age or by physical or mental handicap. State Vocational Rehabilitation agencies, for example, may place disabled workers at reduced wages if the individual is involved in work activities related to training and/or evaluation programs. Persons whose impairments preclude competitive employment may also be compensated at less than minimum wage if they are working in work activities centers sponsored by the Department of Labor. In any case, the wage paid a handicapped worker cannot be less than 50% of the wage that is paid to a non-handicapped individual for the same type, quality, and quantity of work. The Secretary of Labor is charged with the regulation of employment at less than minimum wage (The President's Committee on Employment of the Handicapped, undated).

MEMBERSHIP IN THE COMMUNITY

In the analysis of life functions, particularly the social-attitudinal life function but others as well, it became apparent that many disabled persons have difficulties centering on participation in the life of their communities and, more basically, social interaction. While many difficulties clearly arose from the disability itself, no problem in social and community functioning is completely divorced from the attitudes and behaviors of others. If, for example, the cerebral palsied person has a physiologically-based speech defect, this defect may make it difficult for others to understand his conversation and may make them feel uncomfortable in the situation. Their signs of discomfort may in turn make the cerebral palsied person uncomfortable. The reactions of others to the cerebral palsied person may exacerbate communication problems, either making it more difficult for him to express himself or causing him to fear and avoid potentially uncomfortable situations. Where the able person is not only uncomfortable but negative or rejecting, the vicious circle becomes more pronounced and has more severe consequences.

In this section, rather than reviewing aspects of limitation in social and community functioning which surfaced in the life function analysis, we focus on the interactive effects of the person and his community environment, highlighting environmental factors which complicate or multiply and add to the problems of disabled persons. After reviewing some problem areas which emerged from the literature, we turn to a brief analysis of attitudes toward the disabled, on the assumption that negative attitudes often underlie limited participation in the community by the disabled. Finally, we discuss the ways in which legislation has possibly hindered and facilitated participation in the community.

The Family

Treatments of disability and the family generally focus on three topics:

(1) the family as a cause of disability.

(2) the family as a determinant of rehabilitation progress and outcome.

(3) the effects of disability on the family.

While the literature emphasizes the effects of disability on the family, the influence of the family on disability has not been totally ignored. There is evidence that home environment is an etiological factor, particularly in the cases of mental illness and mental retardation, and to a lesser extent for certain disabilities such as arthritis and heart disease which are believed to be caused or exacerbated by stress and anxiety.

There is also evidence that family support for the disabled person influences rehabilitation outcome and adjustment. Litman (1962, 1966) found that while family support for the disabled person rehabilitation outcome, support, acceptance, and encouragement facilitated positive response to rehabilitation. The same emphasis on the importance of family context was echoed by Slater, Sussman, and Stroud (1970), who estimated its influence on outcomes for spinal cord injured patients to be greater than "considerations of the patient's characteristics or conditions, continued therapy or spontaneous physical recovery."

Perhaps to greatest importance are the interactive effects of family and disability. The presence of a disabled family member creates a variety of strains on the family. In the case of developmental disabilities and congenital impairments such as blindness and deafness, the strains begin when parents confront the fact of a handicapped child. When an adult is disabled, similar crises of acceptance occur. Specific strains develop through the course of disability.

1. The family is often drained financially or is not as financially productive as it was. This creates especially severe strains on families which initially had lower incomes.

2. Marital strains develop, particularly if one member becomes responsible for many aspects of care of the disabled spouse or if sexual functioning is restricted or impaired.

3. Children often react emotionally to the disablement of a parent or have difficulty relating to a mentally retarded or otherwise disabled sibling.

4. The family's social participation outside the home may be limited if, as in the case of dialysis patients, one cannot predict when one will feel well in order to plan in advance; when physical exertion must be limited as in the case of the heart patient; when mobility in the community becomes a major effort as with the spinal cord injured; or when fear of ostracism makes the parents of a severely retarded child reluctant to take him out in public.

5. Even within the home, family members must sometimes accommodate, changing their schedules, planning different meals, and adjusting to other special procedures and requirements of care.

These problems may exacerbate the problems of a family in which is already in conflict, create new conflicts, or alter family dynamics and roles. Strains on family members may, in turn, cause them to behave in ways which are not conducive to rehabilitation. At one extreme, family members may become overindulgent, overprotective, or overly anxious, increasing, as a result, the dependency of the disabled member. At the other extreme, they may react to strains by attempting to escape the situation, or displaying hostility toward the disabled member, possibly even outright rejection. In this case, the effects on the disabled may take such forms as lowered self-concept, social isolation, emotional insecurity, and so on.

Community Participation

There is ample evidence that some disabled persons become social isolates. In the case of schizophrenia, withdrawal from social relationships is a primary symptom of the condition, and it, in combination with negative attitudes on the part of the able population, results in severe isolation, lack of friendships and limited participation in social activities. The mentally retarded, too, often lead isolated, passive lives. In the case of the cerebral palsied, the same appears to be the case, with problems at their peak during adolescence when physique becomes very salient and when pressures for peer group conformity are greatest. Deviant speech, drooling and protruding tongue may spawn social rejection or at least a fear of it sufficient to limit social participation. In the case of the deaf and blind, participation in the life of the community may be limited due to the limitation of the senses, so that for the deaf, communicating health needs to physicians, attending religious services, and benefitting from mass media become problems. At the same time, the environment is not often adapted to the needs of the disabled except perhaps when Harry Reasoner occasionally presents news for the deaf. Those who are wheelchair-bound might participate more fully in the community if the physical environment were not so rich in obstacles to mobility--if low cost barrier-free housing were available, if public and private buildings were accessible, if mass transportation were designed to accommodate the physically disabled, and so on. The disabled person must live not only with his own impairments but with an environment which is ill-suited to him.

The recently completed Urban Institute (1975) study of the needs of the severely disabled highlighted several problems in gaining membership in the community.

1. Analysis of a 1970 Census sample of households with disabled persons indicated that about 15% lived in substandard housing. The figure was one out of five for the severely disabled as contrasted with one out of ten for the partially disabled. Though this difference was largely a function of lower income levels among the severely handicapped, a gap remained even when income was controlled.

2. Among persons who were denied vocational rehabilitation services on the basis of severity of disability, 16% had problems getting in and out of their homes and navigating within them because of architectural barriers.

3. Almost a third of the same sample left their homes once a week or less, and transportation needs emerged as a major need of the group, second only to the need for employment.

4. The severely handicapped have few social contacts or activities outside their families and frequently depend on their families for transportation and other assistance.

Attitudes Toward the Disabled

Attitudes are typically measured as generalized dispositions toward groups of people which may or may not predict behavior toward the disabled. Nonetheless, it is instructive to examine the attitudes of the nondisabled toward disabled groups in order to assess which groups are likely to experience the greatest prejudice, and potentially, discrimination. The functioning level--the handicap or life outcome--of a disabled person is affected by the attitudes and behaviors of others toward him.

A literature search revealed only two social distance studies which measured attitudes toward the majority of the case study disabilities and two others which included at least four of them. These four studies are summarized in Table 3-20, in which the groups which were the focus of each study are ranked from most to least acceptable on social distance scales. Case study disabilities are underlined to facilitate comparison.

Tringo (1970) administered a social distance scale to high school students, college students, graduate students, and rehabilitation professionals. For each group, respondents checked a point on the social distance scale which represented the closest relationship they would be willing to have with that group. The nine scale points ranged from "would marry" to "would put to death."

TABLE 3-20

Rankings of Case Study Disabilities from Most to Least Acceptable in Four Social Distance Studies

Tringo(1970)[a]	Harasymiw, Horne & Lewis(1976)[b]	Shears & Jensema(1969)[c]	Siller, Chipman, Ferguson, & Vann(1967)[d]
1. Ulcer	1. Diabetes	1. Amputee	1. Deafness
2. Arthritis	2. Asthma	2. Wheelchair	2. Blindness
3. Asthma	3. Arthritis	3. Blind	3. Amputation
4. Diabetes	4. Ulcer	4. Harelip	4. Skin disorders
5. Heart disease	5. Heart disease	5. Stutterer	5. Paralysis
6. Amputee	6. Amputee	6. Deaf mute	6. Body deformations
7. Blindness	7. Blindness	7. Cerebral palsy	7. Muscular dystrophy
8. Deafness	8. Deaf	8. Mentally ill	8. Cerebral palsy
9. Stroke	9. Old age	9. Retarded	
10. Cancer	10. Stroke	10. Homosexual	
11. Old age	11. Cancer		
12. Paraplegic	12. Epilepsy		
13. Epilepsy	13. Hunchback		
14. Dwarf	14. Cerebral palsy		
15. Cerebral palsy	15. Tuberculosis		
16. Hunchback	16. Mental illness		
17. Tuberculosis	17. Mental retardation		
18. Ex-convict	18. Ex-convict		
19. Mental retardation	19. Alcoholic		
20. Alcoholism	20. Drug addict		
21. Mental illness			

[a] Based on responses from 455 high school students, undergraduate and graduate students, and rehabilitation professionals

[b] N=1030 in New England general population

[c] N=97 adults, ranking based on acceptability as a friend

[d] N=394 high school and college students and adults

The mean scale response to the group which was most negatively rated (the mentally ill) indicated an attitude somewhat less favorable than acceptance of the mentally ill as fellow employees but more favorable than "would keep away from." Only two case study disabilities--kidney diseases and emphysema--were not included in the study.

A more recent study by Harasymiw, Horne, and Lewis (1976) included most of the same groups studied by Tringo, and eleven of the fourteen case study disabilities. Although the study as reported was based on a varied sample of over 4,000 respondents, the authors did not report overall rankings of the disability groups. Consequently, Table 3-20 describes findings for a subsample of 1,030 New England residents different in nature from the students and professionals studied by Tringo. The social distance scale used contained eight items ranging from "would accept as an intimate friend" to "would be better off dead." Shears and Jensema (1969) administered a social distance scale to adults, and for purposes of this analysis, rankings of disability groups are based on the percentage of subjects indicating a willingness to accept members of each of ten groups as friends. Finally, the Siller, Chipman, Ferguson, and Vann (1967) study is similar to the Tringo study in that the subjects were primarily high school and college students.

For purposes of analysis, disabilities can be divided into the same four clases identified in the life functions section of this report.

1. Chronic diseases typically without external manifestations: disabetes, heart disease, cancer, arthritis, kidney disease, emphysema.

2. Motor disabilites: stroke, spinal cord injury, and cerebral palsy.

3. Sensory disorders: blindness and deafness.

4. Behavioral disorders: mental retardation, mental illness, and epilepsy.

In Tringo's study, behavioral disorders were the least socially acceptable, with the less visible condition of epilepsy faring somewhat better than mental retardation and mental illness. The sensory disorders of blindness and deafness were relatively acceptable and similar to each other in acceptability. Acceptance of internal disorders and visible physical impairments, on the other hand, depended on the specific disability at issue. Of the chronic diseases, for example, diabetes, heart disease, and arthritis were well accepted, while cancer was relatively more stigmatized. Of the visible motor impairments, stroke, paraplegia, and cerebral palsy were rated in that order of acceptability and had medium rankings.

The correspondence between Tringo's findings and those of Harasymiw, Horne, and Lewis (1976) is remarkably close. Whereas arthritis was ranked second and diabetes fourth in Tringo's study, the two reverse ranks in the Harasymiw, et al., study such that diabetes is first and arthritis third. Mental retardation fell just behind mental illness in the latter study, whereas it was rated slightly higher by Tringo's subjects. Otherwise, the order of acceptability of the case study disabilities remains precisely the same from study to study. The remaining two studies focused on a smaller number of groups and used different terminology to describe groups. It is difficult, for example, to infer attitudes toward the spinal cord injured when the stimulus terms were "paraplegia" in Tringo (1970), "wheelchair" in Shears and Jensema (1969), and "paralysis" in Siller, et al., (1967). However, the rankings of disabilities generally appear to correspond to those reported by Tringo and Harasymiw, et al.

The following generalizations seem to hold true:

1. The behavioral disabilities, mental retardation and mental illness, and to a lesser extent epilepsy, are consistently the most stigmatized disabilities.

2. Cerebral palsy, which also has multiple effects on behavior, is almost as severely stigmatized.

3. Although it is difficult to conclude anything about paraplegia given the variations in terminology, stigma does not appear to be severe.

4. While cancer is highly stigmatized for an internal disorder or chronic disease, it is neither highly acceptable nor highly unacceptable overall. Heart disease, arthritis, and diabetes are apparently more acceptable by comparison and are very acceptable in general.

5. Blindness and deafness are relatively unstigmatized.

These studies, particularly those of Tringo and Harasymiw, et al., strongly suggest that Americans hold rather consistent and stable attitudes toward various disability groups. Tringo (1970) interpreted the consistency of responses across subgroups of the population he studied to support the "contention that prejudice exists toward the disabled." Generally, Americans appear to find the physically disabled most acceptable, the sensory disabled moderately acceptable, and the behaviorally disordered least acceptable. According to Harasymiw, et al., attitudes are based on the degree of conformity a group demonstrates to major societal standards. Those who cannot meet standards of productivity and acceptable behavior, or who reject societal values, are stigmatized most severely.

This stigmatization of behavioral deviants is particularly striking in Table 3-20, where ex-convicts, alcoholics, drug addicts, and even homosexuals are severely stigmatized, sometimes even more so than the mentally ill and mentally retarded. Not only do these persons deviate from societal norms, but in the public's mind, they choose to do so and are not just the victims of a congenital condition or disease. The point which these studies demonstrate most dramatically, then, is that Americans are intolerant of behavioral deviancy, whether it is organically caused or a matter of personal conviction. The disabled such as the mentally ill, mentally retarded, cerebral palsied, and epileptic are perceived as deviants who cannot be relied upon to behave in socially acceptable ways.

Bases for Attitudes Toward the Disabled

There are two primary approaches which can be used in identifying factors which underlie attitudes toward the disabled: (1) examination of respondent characteristics correlated with attitude; (2) examination of characteristics of the disabled which are salient to respondents and which possibly account for their attitudes being positive or negative. In this section, we briefly review the demographic and personality correlates of attitudes and discuss bases for attitudes toward the disabled.

This section is based primarily on two sources: English (1971), a review of the literature on attitudes toward physically disabled persons, and Yuker, Block, and Young (1970), in a monograph on the Attitudes Toward Disabled Persons Scale and research using it.

Demographic Correlates

1. Age: There is little or no relationship between age and attitudes toward the disabled.

2. Educational level: The evidence is not consistent, but adults with higher education tend to be more accepting of the disabled than those with less education.

3. Sex: Females consistently display more accepting attitudes.

4. Disability: Type and degree of physical disability and age of onset of disability in the respondent are not related to acceptance of disability.

Other demographic variables such as socio-economic status, marital status, nationality, race, urbanization, and religion either have not been studied extensively enough to permit conclusions, or have yielded inconsistent data.

In conclusion, relationships between demographic characteristics and attitudes toward the disabled appear to be weak and unstable. The strongest relationship indicates that females are consistently more positive than males, and there appears to be a tendency for attitudes to become more positive as a function of educational level.

Personality Correlates

1. Aggressiveness: People with low needs for aggression and expression of hostility tend to be more positive toward the disabled.

2. Self-concept: Those with positive self-concepts tend to be more positive.

3. Anxiety: Those who are low in manifest anxiety tend to be more positive. Again, other variables have been studied but not extensively, and again, even the relationships identified above appear to be rather weak.

Attitudinal Correlates

1. Attitudes toward the physically disabled in general appear to be closely related to attitudes toward specific types of disabled persons.

2. Attitudes toward the disabled are correlated with attitudes toward other groups--for example, the aged and minority groups.

3. There is some indication that general authoritarianism underlies negative attitudes toward the disabled, and that those who

reject the disabled tend to reject a variety of groups which are perceived as different.

Experiential Correlates

1. Increased contact with the disabled is related to more positive attitudes.

2. Certain types of contact are better than others. Positive attitudes are associated with close personal contact, socializing, and contact in educational and employment settings more than with contact in medical and rehabilitation settings.

Underlying Cognitive and Affective Mechanisms

Siller, Chipman, Ferguson, and Vann (1967) asked 65 subjects to discuss their attitudes toward the disabilities studied (amputation, blindness, body deformations, cerebral palsy, deafness, muscular dystrophy, paralysis and skin disorders). From their direct responses or as inferred from their explanations of their attitudes, Siller, et al., developed the following typology of attitudinal bases. The number in parentheses indicated the number of interviews in which the concept appeared.

Aversive Content Categories

1. Functional limitations of the disabled (44)
2. Aesthetic-sexual aversion (48)
3. Strain in social interaction (43)
4. Negative atypicality (22)--looking different
5. Attribution of negative qualities (29)--inferring negative personality
6. Loss of empathic potential (7)--feeling estranged from the disabled.

7. Fear it could happen to self (22)
8. Suffering through empathy--imagining the suffering of the disabled (22)
9. Fear of burden or responsibility (25)
10. Fear of social ostracism--anticipating negative consequences if one consorts with disabled (19)
11. Fear of contagion or inheritance (12)
12. Guilt--over being able, or over injustices to disabled (8)
13. Specific experience negative (25)

Siller, et al., (1967) offered this list along with four nonaversive content categories--"benevolent attitude," "specific experience positive," "sympathy," and "the handicapped seen as human or equal." Further analysis indicated that of the aversive content categories, the following are most closely related to general acceptance of the disabled: aesthetic-sexual aversion, strained interaction, negative atypicality, and fear it could happen to self. On the basis of this information, Siller, et al., emphasized the following in drawing conclusions from their research.

1. People have a strong "gut" reaction of aesthetic-sexual aversion which may be resistant to modification.

2. People sometimes make realistic assessments of the functional limitations of the disabled which underlie their attitudes. However, when estimates are unrealistically low, demonstration of the disabled person's true abilities may help to change beliefs.

3. Strain in social interaction is a core problem but one which might be solved through increased contact under pleasurable circumstances and training of the disabled to reduce anxiety in the nondisabled.

4. It is too simplistic, in view of this analysis, to characterize attitudes toward the disabled along a single favorable-unfavorable dimension.

Trends in Attitudes

It is hazardous to compare studies of attitudes toward the disabled conducted at different points in time when methods and procedures vary widely. And it is rare that the same questionnaire is given repeatedly at different points in time. As a result, there is little information about trends in attitudes toward the disabled. In this section, two studies are described which touch on the issue and which focus on two groups which are severely stigmatized in the United States--the mentally ill and the epileptic.

Aviram and Segal (1973) attempted to infer historical change from analysis of five studies of attitudes toward the mentally ill which used social distance scales. Scores from the five studies were standardized on a six-point acceptance-rejection scale. The following average social acceptance scores were obtained, from oldest to most recent: 3.03 (Cumming & Cumming, 1957), 2.68 (Phillips, 1963), 3.17 (Yamamoto & Dizney, 1967), 3.54 (Dohrenwend & Chin-Shong, 1967), and 3.92 (Bentz & Edgerton, 1971). These scores suggest that attitudes toward mental illness are becoming somewhat more accepting, although even the recent average responses indicate that people are not amenable to "living with a former mental patient."

A similar upward trend in acceptance of epileptics was evidenced in a replicated Gallup Poll administered every five years since 1949 (Caveness, Merritt, & Gallup, 1974). The survey asked several questions, three of which are highlighted in Figure 3-9. Trends from 1949 to 1974 indicate that Americans became less likely to object to their children playing or associating with epileptics (57%-68%-67%-77%-81%-84%), less likely to consider epilepsy a form of insantity (59%-68%-74%-79%-81%-86%), and more supportive of epileptics being employed in jobs like other people (45%-60%-75%-82%-76%-81%). However, the authors pointed out that there remained, in 1974, 10.3 million people who opposed epileptics' working. This study stands alone as a source of empirical data about trends in attitudes and provides, along with the suggestive analysis by Aviram and Segal (1973), grounds for optimism, assuming that there is not a threshold beyond which attitudes revert toward the negative end of the continuum. In each of the six surveys conducted by Gallup, the most favorable opinions were held by the more educated, the better employed, the young, and the urban. More prejudice was evident in the Southern region than in other regions of the country.

Legislation Affecting Community Membership

Throughout history, negative attitudes toward the disabled have been codified as law. Restrictive and prohibitive laws have

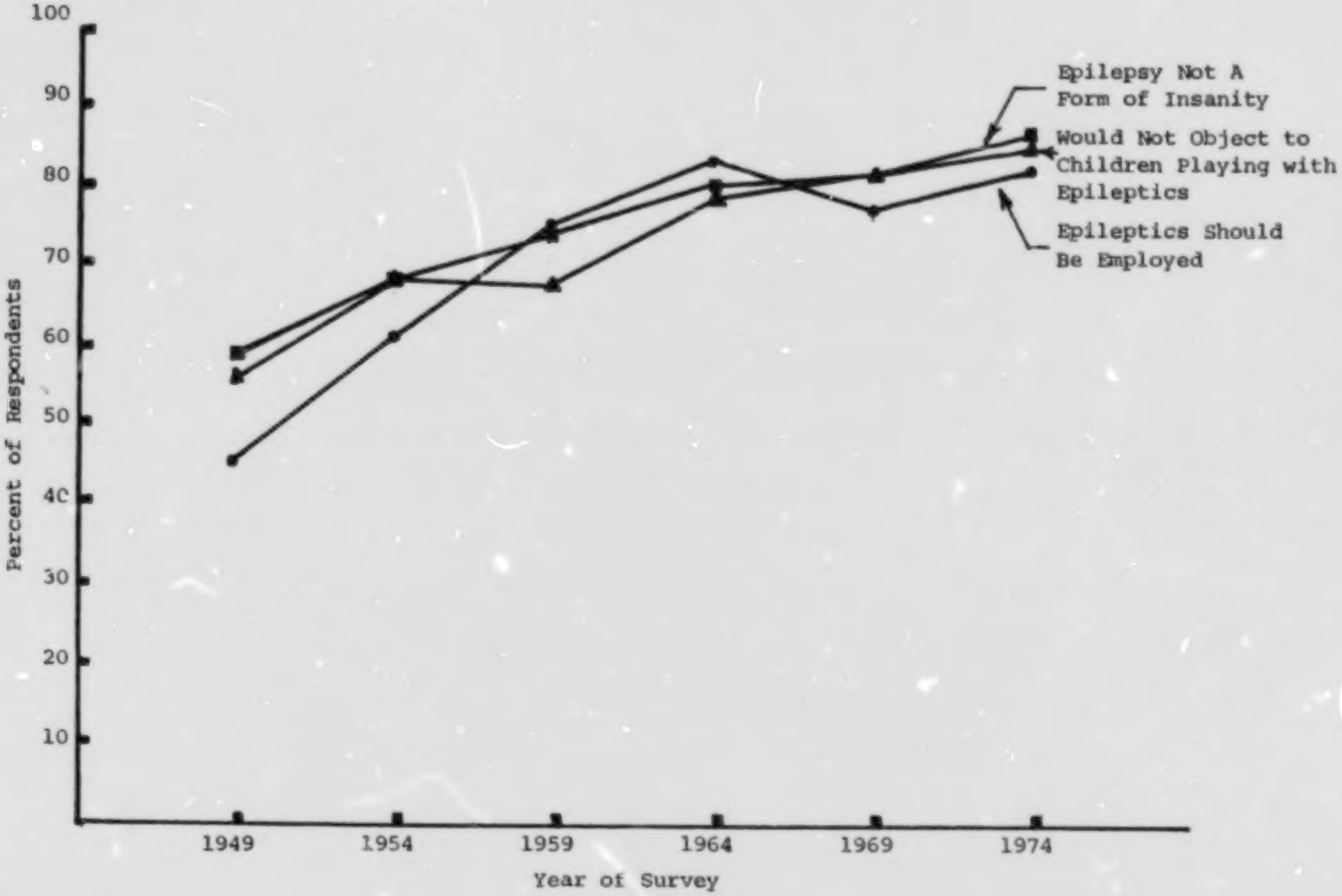


Figure 3-9. Changing attitudes toward epilepsy (Caveness, Merritt, & Gallup, 1974)

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been obstacles to the attainment of full citizenship status by the physically and mentally handicapped. While most recent legislation regarding the rights of the disabled people in the United States has focused on the mentally retarded and mentally ill, particularly with respect to rights to treatment in institutions or liberties, these initial legal efforts are applicable to all disabled individuals. The United Nations Declaration on Rights of Mentally Retarded Persons (1971) states that "the mentally retarded person, to the maximum degree of feasibility, has the same rights as other human beings." These rights include the right to life, the right to development of one's sexual and social identity, the right to marry and procreate, the right to education, the right to vote, and the right to move freely in society.

Despite these positive indications, an examination of current state laws reveal that not only are the retarded and other disabled persons victims of informal prejudices and discrimination, but they have been explicitly denied, in some states, the privilege of exercising basic human rights. Here we briefly review some areas of rights and legislation bearing on them.

Marriage and Family. As of 1972, at least twelve states had prohibitive laws regulating the right of a mentally retarded person to marry (based on a summary of laws pertaining to the handicapped by Stephenson, McWilliams, & Fisher, 1975). In many other states, there exist marriage laws relating to competence or capacity, which though they do not explicitly mention the mentally retarded, make marriage very difficult to achieve legally. As of 1965, four states prohibited marriage by an epileptic. By early 1969, this number was reduced to one (West Virginia). In that same year, however, the United States became free of such marital statutes applicable to epileptics (Stephenson, _et al._, 1975).

Thirty-two states have sterilization laws; in twenty-four, sterilization is explicitly authorized by law (as of 1972). Most of these laws do not require consent and are largely aimed at institutionalized residents. During the past decade the _application_ of sterilization laws with regard to epileptics has been virtually abandoned. It should be noted, however, that as of 1969, while not in use, such statutes still appeared on the books in eleven states.

Driver's Licenses. As of 1972, twenty-two states had prohibitive laws regulating the right of the mentally retarded to procure a driver's license. Twelve others had provisions allowing for adjudication of incompetence. Six states have licensing standards that apply specifically to persons with epilepsy; that is, legislation that singles them out for consideration. Seven states require licensed physicians to report all cases of epilepsy to a state agency such as the Department of Motor Vehicles or the Department of Public Health. Most states require medical certification of seizure control over a specific period of time. Although Alaskan law prohibits licensing of persons subject to epileptic seizures, the provision is not interpreted as an outright prohibition. Only Mississippi reports that its driving license statute is interpreted to prohibit licensing of epileptics. It is important to note that the overall number of accidents attributable to epileptic seizures is small. Between 1949 and 1959, only 1/3 of 1% of persons known to be subject to epileptic seizures were involved in auto accidents due to seizures (Barrow & Fabing, 1966).

Voting. Five states (as of 1974) had laws explicitly denying the retarded the right to vote. Twenty others allowed for adjudication of incompetence and excluded incompetents from voting. As of 1976, only twelve states grant institutionalized persons the right to vote, eighteen do so unless the person is adjudicated incompetent, twenty-one declare the "insane" and others ineligible, and three states explicitly deny voting rights to the institutionalized (Mental Health Law Project, 1976). The physically disabled have been the object of some recent state legislation designed to facilitate the exercise of this basic right. The District of Columbia has a special provision for shut-ins and physically impaired persons who are unable to appear at the place of registration, and other states provide assistance and absentee voting to physically disabled persons (The President's Committee on Employment of the Handicapped, undated).

Guardianship and Adoption. The United Nations Declaration on Rights of Mentally Retarded Persons (1971) has a provision which states that "the mentally retarded person has a right to a qualified guardian when this is required to protect his personal well-being and interests." Guardianship laws are provided in practically all states, but they tend to operate in the absence of expressed statutory authority. That is, they more often take the form of practices or policies and are sometimes overused (Locke, 1973). As of January, 1969, at least six states had legal codes concerning legislative methods relative to the adoption of a child who develops epilepsy. Generally these laws hold that if the parents were unaware of the child's condition and if the condition existed prior to adoption, the adoption could be annulled within five years (Harlen, 1965).

Criminal Justice. A particularly important issue is the effect of criminal law on disabled citizens. In a study of Georgia's criminal justice system, it was found that only 5% of the estimated 140,000 mentally retarded citizens in the state ever come in contact with law enforcement authorities (Atlanta Association of Retarded Citizens, 1974). Studies have shown that retarded persons are not necessarily more likely to commit crimes, but if they do, they are more likely to be arrested. Legal authorities are divided over how much responsibility must be attached to the anti-social or criminal behavior of retarded persons. Questions center on the degree to which mental retardation interferes with the ability to act responsibly. The M'Naghten Rule States that a person is not criminally responsible if he is unable to distinguish between right and wrong. The Durham or Product Rule states that the accused is not responsible for a criminal act if such act was the product of a mental disease or mental defect (Stephenson, *et al.*, 1975).

The idea that epileptics have criminal inclinations was engendered by the early belief that the epileptic was morally depraved (EFA, 1975). Recent research, however, has failed to discover any investigation in the past forty years which proves that there is a higher rate of criminal actions among epileptics than among other persons (Livingston, 1972). In regard to civil liability for harm inflicted on other persons as a result of a seizure, Barrow and Fabing (1966) state that the general rule is as follows:

> If a person faints or loses consciousness and there is resulting harm to another, the person inflicting harm is not liable civilly for negligence unless the loss of consciousness was forseeable (p. 122).

Education. One of the basic principles underlying human rights is instrumental protection, which is society's obligation to provide for its members the special assistance they might need to exercise their rights. This includes the right to education. Although free public education is taken for granted by most Americans, large numbers of mentally retarded children have been denied this right. And, as recently as 1959, 22% of all public schools did not admit children with epilepsy (Wallace, 1960). Concerning the present situation, Livingston (1972) writes:

> Fortunately we do not believe that the unwarranted discriminatory situation exists to any significant extent today. Our observations indicate that persons with epilepsy only rarely, if ever, are currently barred from attending regular public or private schools on the basis of a diagnosis of epilepsy per se (p. 498).

Although many colleges had discriminatory policies in the past in regard to epilepsy, they appear to have adopted a different attitude in recent years.

With regard to legislation affecting the rights of handicapped children in general, federal law (P.L. 93-380, Education Amendments of 1974) states that all States receiving federal funds to assist in the education of handicapped children must ultimately provide full educational opportunities to all handicapped children (The President's Committee on Employment of the Handicapped, undated). Public Law 93-380 also requires integration of the handicapped and non-handicapped children to the maximum extent possible in a state's public school system. This impetus has been furthered by the Education for All Handicapped Children Act of 1975 (P.L. 94-142), which assures public education for all handicapped children and has already brought significant change to the educational system. Federal law also mandates that at least 10% of the total enrollment opportunities in every state Head Start Program be available to handicapped children, and special services must be provided as necessary to meet the needs of such children (President's Committee on Employment of the Handicapped, undated).

Since implementation and realization of the federal provisions is the responsibility of the States, there has been considerable lack of uniformity in educational programs for the handicapped across the United States. There are still many mandates which carry conditions with them that effectively eliminate some students from education. However, more and more states are moving to the concept of comprehensive programs for all handicapped children and away from cateogrical labels (EMR, cerebral palsy, etc.). "Zero reject" and "right to education" laws are substantially changing the situation, making it possible for many severely and multiply handicapped children to receive an education.

Access to Buildings and Transportation. Although most people are not aware of the fact, the 1973 Rehabilitation Act prohibits discrimination on the basis of mental or physical disability. Discrimination against handicapped individuals with regard to access to public buildings and activities is explicitly prohibited by law in some states and all activities receiving financial assistance from the federal government must be open to all disabled persons. Maryland, the District of Columbia, and the federal government have established agencies which deal specifically with disabled individuals' complaints related to denial of access to public facilities. A handicapped individual who has been denied admission to a restaurant, cinema, hotel or any other public facility should file a complaint,as such denial is illegal (President's Committee on Employment of the Handicapped, undated).

While this legislation prohibits the denial of access to public facilities on the basis of disability, it does not guarantee nor require that all public buildings be accessible architecturally. Most recent federal legislation concerning the elimination of architectural barriers applies only to buildings constructed or leased totally or in part with federal funds. The Architectural Barriers Act of 1968 requires that federally funded construction be accessible and useable by the physically handicapped, but the law does not apply to older buildings constructed before the standards became statutory, unless such buildings are being substantially renovated or reconstructed. The Architectural and Transportation Barriers Compliance Board was created to insure compliance with architectural barriers laws, but some recent studies have shown that compliance is less than adequate in many federally funded structures (see The Urban Institute, 1975, for a review).

The accessibility standards specified by the Architectural Barriers Act of 1968 do not apply to private residential structures nor to military facilities, but at least two states (Maryland and Virginia) have passed laws which require that all new buildings intended for public use be accessible even when constructed with private funds. In many cases, however, these laws do not specify standards and, consequently, "accessibility" may be subject to various interpretations at the local level. Sometimes, the complexities of local building codes may also inhibit the achieving of a barrier-free environment (Kliment, 1975). There are also indications that many architects and planners are unaware of the laws concerning architectural barriers (President's Committee on Employment of the Handicapped, undated).

The Housing and Community Development Act of 1974 makes provisions for the removal of architectural barriers in public housing. At least 10% of all public housing units must be accessible to the physically disabled. The Act also states that two or more single disabled or handicapped individuals living together, or one or more such individuals living with another person determined essential to their well-being, are eligible for occupancy in public housing for the elderly (U.S. Code, Title 42). The same act provides physical and qualitative standards for public housing for the elderly and handicapped. With regard to federal housing projects constructed for low income families, a handicapped individual may qualify as a "family," but limits for occupancy and rents are fixed by the public housing agency (The President's Committee on Employment of the Handicapped, undated).

The Federal Aid Highway Act of 1973 authorizes loans to private non-profit corporations to assist in providing transportation services meeting the special needs of elderly and handicapped persons who cannot use mass transit facilities. Furthermore, all federally funded projects designed to improve bus and other motor mass transportation systems must be designed in a way that permits effective utilization by the handicapped and elderly (P.L. 93-87). The Amtrak corporation is authorized by Public Law 93-140 to insure that all Amtrak trains are accessible to the physically disabled and elderly and is currently acquiring special equipment and devices, conducting special training for employees, and engaging in other activities to eliminate architectural and other barriers in existing equipment and facilities (The President's Committee on Employment of the Handicapped, undated).

Summary. Although the legal system has historically been used to deny rights to the disabled, it is increasingly being used to establish their rights and insure that rights are actualized. The disabled themselves are using the system, as are their representatives--legal, citizen, and service system advocates. These trends parallel those in other civil liberties areas, and are concomitant with what appear to be generally more positive societal attitudes toward the disabled.

CONCLUSIONS AND RECOMMENDATIONS

The primary substantive findings of our review of the literature on fourteen disabilities can be expressed as follows:

1. Disabilities do not generally have standard definitions, nor are adequate systems for classifying subgroups within a disability group available.

2. Although prevalence estimates vary widely from study to study, it is clear that the disabled population is large and can be expected to increase.

3. Disability affects all subgroups of the population, with different disabilities striking harder in some subgroups than in

others, and with an overall tendency for disability to be most common among the old and among the poor.

4. The causes of disability are diverse, so diverse that no disability studied has only one cause. Several etiological factors are subject to control given the current state of technology.

5. Similarly, the needs and deficits of the disabled are diverse. Overall, our analysis of statements in the literature indicated that most disability groups had needs in all five life function areas. Health, social-attitudinal, and mobility needs were most frequently noted in the literature. There was some basis for clustering disability groups with similar need profiles into larger categories--motor, behavioral, sensory, and chronic disease disabilities. However, differences were detected among groups in each of the four disability categories, and more importantly, differences exist among persons sharing any single disability. One important conclusion of the life function analysis is that since every disability has multiple effects on functioning, there is, to a greater extent than we had predicted, commonality of need within the disabled population. At the same time, however, our analysis reveals where generalizations break down and dictates a strong concern with the nature of each disabled person's unique needs. Though broad classes of needs may be similar across disabilities, specific manifestations of need in individual persons are not.

6. A major reason why commonalities of need appear in the analysis is the high degree of interrelationship among disabilities

(and, we estimate, the high proportion of persons who are multiply handicapped).

7. Membership in the community and membership in the labor force are related not only to functional deficits on the part of the disabled person but to environmental factors, and to the interaction between person and environment. Even many of the functional deficits are attributable to environmental factors, including rehabilitation technologies. However, the state of knowledge is not such that the independent effects of impairment (diagnostic label), disability (or life function deficit), and handicap associated with environmental variables can be untangled. However, the fact that disability labels and even functional deficits are not highly predictive of outcome, underscores the strong role played by environmental factors.

Perhaps the most important conclusion of all is that the state of knowledge about disability in America is sadly inadequate. One can draw few conclusions about the needs of the disabled when the basic data are lacking, and this is precisely the problem we encountered in reviewing the literature. Perhaps because the service delivery system is fragmented, the information available about disability is also fragmented. The degree of validity of the information provided in this report probably varies considerably. Overall, we were unable to accomplish all of our objectives because of limitations in the data base from which we worked. For example, lacking information about numbers affected by various needs, we did not even attempt to tie prevalence figures to life function need statements in order to determine how many persons have given needs or types of needs. Quite clearly, the farther one moved on the continuum from impairment to disability to handicap, the less information was available, making adequate assessment of the problems of labor force and community membership impossible. The literature available on the incidence of disability and mortality rates was so inconsistent from disability to disability that we did not present it here. Similarly, there was virtually no way to establish a consistent framework for the analysis of costs of disability which would fit the available data. Thus, one of the major dimensions of the problem of disability in America is that the "problem" has not been defined.

The problem of ignorance is not merely academic. One cannot plan a coherent rehabilitation policy without knowing who needs what. Take, for example, the Rehabilitation Act's emphasis on providing services to those most in need of services--the severely disabled. For that mandate to be implemented, the meaning of the term "severely" disabled or handicapped must be operationalized. The Vocational Rehabilitation definition names impairments but does little to specify which members of the listed groups qualify to be considered severely disabled. It is clear from our analysis that not all of them do, and moreover that persons with disabilities other than those listed in the definition might also qualify. Even for a disability such as mental retardation, for which degrees of impairment ranging from profound to mild are defined, a mildly retarded person with a set of secondary impairments and living in a less than optimal environment might well be more "severely handicapped"--in the sense of being functionally limited and needing multiple services over an extended period of time--than another person who is clinically labelled "severely retarded."

The state of knowledge about physiological impairments is relatively complete, at least in comparison to the state of knowledge about the ways in which such conditions affect life functions and further interact with the environment to determine handicap with respect to participation in the labor force and community. But, it is virtually impossible to predict functional deficits and needs solely on the basis of knowledge about impairment.

Research Options

1. Definitions: One option is to launch a national effort to standardize definitions of disability in general and specific disabilities. This would permit national census-takers to determine how many people in the population have, for example, some condition which prevents them from working or engaging in another major life activity, and it would permit one to determine which conditions underlie such disability, that is, how many persons are mentally retarded, victims of stroke, and so on.

2. Prevalence Estimates: Development of standard methodologies for conducting prevalence studies would also be an option. Additionally, there might be some strategy developed within a clear

methodological framework and at a national level for handling problems in head counts associated with the relative invisibility of some disabilities (e.g., epilepsy), and with the phenomenon of multiple handicap. Unless the invisibility problem is addressed, the number of disabled persons detected by surveys will be an underrepresentation of the problem; unless the problem of double counting of the multiply handicapped is addressed, prevalence estimates will overrepresent the magnitude of the problem. Methodologies should also address questions of entry and exit from the disabled population, focusing on incidence rates, mortality rates, and the meaning of "rehabilitation." A national prevalence survey would diminish the inevitable inflation of estimates which occurs when groups intimately concerned with single disabilities conduct their own surveys or infer prevalence figures from the research of others.

3. Estimating Needs: The options described above would generate consistent and reliable figures concerning the number of persons who wear various disability labels. If our analysis suggests anything, however, it is that such a census of the disabled would not identify the needs of the disabled since the relationship between diagnostic label and functional need is tenuous. One option would be to provide funding for projects which would develop and validate tools for assessing functional need. However, this strategy would not pay off in the long run if such project grants were awarded by diverse agencies to diverse segments of the larger

delivery system. What is needed is a needs assessment tool which could be applied to any disability group. In all probability, separate forms of the tool would have to be developed for children and adults, and subcultural differences would have to be taken into account in standardizing the scale, as functional level is partially a function of environmental demands for functioning. Such a scale would assess basic areas of functioning on the order of the life functions developed for the present technology assessment. In fact, we would offer the life functions framework (if not the specifics of the data obtained from the literature) as a method which could, with refinement, be used to analyze functional need. However, a needs assessment tool would also have to assess the disabled person's environment, including physical, social, economic, and treatment environments. Determining which needs or functional deficits are environmentally based would be extremely useful in program planning. Finally, it would be worthwhile to consider using the scale with samples of the nondisabled population as well, in order to establish comparative data and insure that standards of performance for the disabled are congruent with normative behavior of the general population.

Issue Areas

The following issues should be addressed in attempting to solve the problem of disability in America. None is an either-or matter.

1. Environment vs. person: In virtually any areas of policy making, one's definition of the nature of the problem determines one's solutions to it. In the field of rehabilitation, as in many other human services areas, the focus has traditionally been more squarely on the person than on the environment. We implicitly or explicitly make the assumption that the handicapped person is deficient and must be changed, through physical intervention or training and counseling, to attain higher levels of functioning or more appropriate, "normal" modes of functioning. If one assumes, by contrast, that much of the problem of disability is rooted in the environment, one develops an entirely different solution set, focusing on eliminating physical and architectural barriers, changing negative attitudes and discriminatory laws, and designing treatment environments in such a way that they shape and maintain adjusted behavior. One might even add a third perspective--a focus on the interaction between the person and the environment as the cause of problems. Given this understanding of the problem, one would aim for optimal matches between certain clients and environments, knowing that different people respond to the same environment in different ways. All three factors--person, environment, and person-environment interaction--play some role. Once the relative influences of each are more precisely determined solutions can be empirically based rather than philosophically based.

2. Prevention vs. Rehabilitation: With medical prevention technologies, life extending technologies, and cures developing

at a rapid rate, an important national policy decision involves allocation of funds to prevention and rehabilitation or habilitation. Even without new technologies, preventive measures taken now--largely through early screening of infants, improved prenatal and natal care, early intervention training, control of environmental causes of disability, and public education regarding health risk factors--could substantially reduce the size of the disabled population. The issue to be weighed is how much to sacrifice the needs of the present disabled population for the societal benefits which preventive technologies might produce in the future.

3. Rehabilitation vs. Habilitation: This issue is unclear because the meaning of rehabilitation is unclear. It is operationalized by state rehabilitation agencies as working for a specified number of days, at some kind of job, and then being considered closed successfully. The term habilitation is used primarily with reference to the developmentally disabled, who rather than being returned to functioning, are provided with functions which they did not previously have. The same concept might well apply as well to those who are disabled at some point in life: the issue is not really restoration of previous function as much as it is acquisition of new behaviors which permit adaptation to the new circumstances which disablement inevitably brings. One must consider too the issue of level of aspiration, whether the goal of rehabilitation is minimal adaptation or some variation on the theme of "maximizing potential."

4. Deficit vs. Asset: The present technology assessment, like most of rehabilitation practice, has focused on deficits or need, devoting relatively little attention to assets or strengths. Although the importance of assessing assets has been voiced in the literature, it is unclear at present how much of a difference implementing an "accentuate the positive" approach would make.

5. Incompetence vs. Deviance: Another issue which has surfaced in the literature centers on the degree to which the problems of handicapped persons inhere in their inabilities to perform expected roles in society and the degree to which such problems are associated with their deviance from norms of acceptable behavior. A person may be able to eat food independently, but because he does so with a spoon rather than a fork and does not have the usual social graces while doing so, he is, if the deviance perspective prevails, less than normal. Like an environmental perspective, a deviance perspective generates a particular class of solutions--namely, an emphasis on changing societal norms rather than changing individual functioning.

6. Vocational vs. Community Adjustment: Although rehabilitation programs for adults have focused almost exclusively on vocational adjustment, it is clear that disability affects much more than vocational functioning, and moreover, that the outcome of successful employment is often unattainable if the person continues to have problems adapting to his family, community, or treatment environment. The goal of preparing handicapped persons

to live with their fellows as contributing members of a social unit, with or without remunerative employment, has not yet been considered seriously as a national policy option.

7. Categorical vs. Generic Services: In our analysis of the needs of handicapped persons, we have searched for similarities and differences across disability groups, and have concluded that while there are similarities, differences between and within groups are often pronounced. The fact of differences within groups points to the inadequacy of categorical service systems which assume that persons with the same disability label need much the same services. Similarities across disability groups also point to the possibility that resources are being ineffectively used and services duplicated. The vocational rehabilitation agency is perhaps a prototype of generic services centered on a particular area of functioning, but it often works with or contracts for the resources of categorical programs. Rather than framing the issue purely in traditional terms--that is, service to one subgroup vs. a service system which is available to all groups--we would suggest examination of the option of organizing a service component around a specific area of need (vocational, transportational, educational, etc.) as contrasted with the option of organizing a component around the set of predominant needs which a subgroup of the disabled population (whether or not this subgroup is synonymous with a diagnostic label) shares and "treating the whole person." This second aspect of the issue involves

deciding whether to serve the whole person or specialize one's resources in order to meet a subset of the person's needs.

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REHABILITATION TECHNOLOGIES

Introduction

This report summarizes the efforts to develop a methodology and a model for studying the distribution and types of technologies employed in the rehabilitation of disability. As in other papers presented in this project, fourteen disabilities were examined. These fourteen disabilities are seen as representative of the problems presented by most disabling conditions and include those which affect major portions of the disabled population. It recognized that there are some diseases or causes of disability which may be devastating in their effects, and have heavy commitment of rehabilitation technologies which are not covered by this project. The choice of the fourteen disabilities to be surveyed was made for the following reasons:

1. Most of the disabling effects caused by these fourteen disabilities are representative of those seen in other disabling conditions.
2. The technologies represented in the rehabilitation of these fourteen disabilities are representative of the technologies applied to other disabilities.
3. Limitations of time and personnel which made adequate surveying of additional disabilities impossible.

The methodology employed in attempting to gather data for this report deserves some discussion, as much to alert other researchers to the pitfalls associated with research in this area as to explain how this report was generated. The methodology discussion will be organized into the following sections:

1. Methodology in data acquisition;
2. Caveats on interpretation of data;
3. Integration of information on rehabilitation technologies;
4. Definition of categories of technologies;
5. Discussion of life functions.

METHODOLOGY IN DATA ACQUISITION

The original plan for collecting data for this project entailed a preliminary search of the literature to: Identify pertinent specific technologies within the disabilities; locate individuals with expertise in rehabilitation technologies; identify advocate organizations specific to the disabilities to be studied. Questionnaires were mailed to spokesman organizations for the fourteen disabilities. These questionnaires contained a wide range of questions on prevalence and incidence figures, numbers and types of different technologies and programs, number of disabled served by specific programs, and new or promising technologies. This portion of methodology met with very limited success. Most organizations representing various disability groups were not prepared to respond to the questionnaire either because they did not have an integrated system of information about the needs, life functions affected, and number and variety of technologies and programs being applied for that particular disability, or they expressed a lack of willingness to participate. It is this last point which bears some careful consideration because it points to one of the major problems in developing an information system of the type attempted in this project--the quasi adversary system which exists in the U.S. as regards allocation of resources and competition for legislative advantages among various disability representatives. The prevailing attitude seems to be, "We look out for our own because if 'they' get theirs, we may not get ours." This competition among disability groups for public and private funds and legislative support for programs mitigates against cooperation in projects such as this, and leads to other problems such as inflated prevalence figures. Surveying national spokesman organizations for the disabilities is not a particularly fruitful approach to gathering data on technologies.

The method decided upon to complete this portion of the study was a search of the literature of the fourteen disabilities for technologies. This approach is of course, fraught with the limitations inherent in any literature search methodology--i.e., for the technologies to be surveyed, it must be represented in the literature, an occurence which is determined only in small part by the fact that the technology exists. It must be written about, and published in a source with a reasonable probability of being surveyed. A technology may be slighted in the literature if it is developed or utilized by persons who are not prolific publishers, or it may be over represented if developed or utilized in an environment which lives under a publish-or-perish dictum.

CAVEATS ON INTERPRETATION OF DATA

In attempting to search the literature on the individual disabilities to ferret out technologies, difficulties were encountered which should serve as caveats in the interpretation of the data which follows, and as guidance to future researchers in this area.

1. As previously mentioned, representation of technologies in the literature is affected by many factors other than the existence or non-existence of the technology or program. That facet need not be belabored.

2. The problem of defining TECHNOLOGY is itself an area worthy of study. Does the alteration in the design of an existing technology constitute a new technology, or is it to be included under an existing technology? A point in case involved devices such as hearing aids, or surgical repair techniques. There are a large number of different hearing aids available which utilize different methods of operation, and there are a wide variety of surgical techniques (bearing the name of the innovator) for the correction of a given problem. A problem of definition of these as separate technologies was partially resolved as discussed in a following section. This problem is in contrast to technologies or programs which have had wide application to many disabilities and many problems, but which go by a single name, not associated with any given disability. In this category are such technologies as psychotherapy and special education. Within these technologies are a myriad of other technologies, which are seldom if ever discussed. These technologies also have specific adaptation when applied to different disabilities, but are not identified by specific innovator names, or brand names as are hearing devices or surgical techniques. These considerations taken together should serve as sufficient caution to the reader that even with efforts to keep technologies at approximately the same level of

definition, the listings are not weighted to reflect the real impact of the technology in terms of the number served or the amount of dysfunction alleviated.

3. The literature on some disabilities is more advanced, and much more multi-disciplinary--as in the case of schizophrenia as opposed to cancer of colon/rectum (which is discussed almost exclusively in medical literature). Because of this, the number of technologies in some cases reflects the quality and diversity of the literature from which researchers could draw. Differences in research style among the literature reviewers, and differential familiarity with different disability areas also biased results since some areas were more heavily researched than others when they could be directed by personal knowledge of technologies or disabilities.

INTEGRATION OF INFORMATION ON TECHNOLOGIES

The first question to be answered is, "What is a technology?" The Webster's definition which comes closest to the present purposes is, "A method, process, etc., for handling a specific technical problem." Not much help from Webster. The problem in classifying rehabilitation technologies revolves about a distinction between technologies and techniques. We have chosen to define technology in the following way--a technology is a collection of techniques which are similar to each other in application (even though they may differ in detail of application) which are qualitatively different from other collections of techniques which may address the same problem. Examples of collections of techniques which become technologies under this definition are: Surgical technologies to correct orthopedic deformities, and orthopedic braces. Both of these technologies include a number of specific techniques which are different from each other, but in the one case, all involve surgical repair, and in the other, all involve bracing.

This two level approach using techniques and technologies was done in an effort to avoid level of complexity problems which arise if one considers a particular brand of hearing aid as being on the same categorical level as a technology labeled Special Education.

DEFINITION OF CATEGORIES OF TECHNOLOGIES

Having arrived at a reasonable, albeit subjective, definition scheme for technologies and techniques, it was decided to categorize technologies according to the mode of application, either environmental change, physical intervention, or training/counseling.

These categorizations are defined below:

1. Environmental change. Technologies designed to change the environment and thereby effect a change in the disabled person's functioning. This class includes the broad areas of community design, design of living environments, alterations in vocational environments, and transportation. The concept of community design is broadly conceived to include changes in both the physical and social environment, e.g., adaptive architecture and community attitude change technologies.
2. Physical intervention. Technologies which change the person through physical means, including use of physical devices (e.g., prosthetics), introduction of chemical change (e.g., medicine, dietary programs), or surgical techniques (e.g., transplantation, neurosurgery). These technologies can sustain life, restore functions, or augment functions.

3. Training/counseling. Technologies which consist of training, education, or therapy designed to sustain, restore, or augment functioning by altering skills, cognitions, or attitudes.

As with physical intervention, the aim is an alteration in functioning, but it is achieved without physically intervening to alter the body and/or its processes.

Training/counseling technologies include the whole range of academic and vocational education, corrective therapies, and psychological counseling and therapy.

An additional category of application of technologies--service delivery, while belonging in the larger class of technologies which alter the environment of the disabled, is conceived of as distinct from the three major technology categories. It is seen as an alternative to innovation in rehabilitation technology, and therefore are treated separately.

DISCUSSION OF LIFE FUNCTIONS

A second major classificatory scheme devised for this project is the effect of disability on Life Functions. This scheme is covered in detail elsewhere, however, the basic notion is that disabilities cause, or result in inability to perform functions in one or more key life functions. These have been defined as follows:

1. Mobility Functions. Limitations in the area of mobility includes difficulty using manual skills to manipulate objects or devices, difficulty locomoting within a living or working environment, and/or difficulty moving from place to place in the community.

Example of group with major impairment: quadriplegic.

2. Health functions. If impaired in this area, the person is lacking the general sense of physical well-being called good health; must devote a large part of his or her energies to staying alive or coping with pain; or must avoid activities which would risk life or well-being. If a condition is controlled--for example, if medicine can eliminate the risk of an epileptic seizure as long as it is taken, the person is not limited in the health functions area. If however, needs for continuing treatment interfere with living and working, a limitation exists.

(Mental health has been deleted from this category so that it more squarely focuses on physical health.)

Example: heart disease patient.

3. Communication functions. If impaired, the person has difficulty sending and/or receiving messages from other persons, either because of impairment in the senses or mechanisms of communication or because of the content of communication is deviant (as in the case of the mentally ill).

Example: deaf.

4. Cognitive-intellectual functions. If impaired, the person has difficulty intellectually manipulating symbols and objects, acquiring new cognitions and behaviors, and/or transferring learning to new situations. The impairment can be congenital or it can be environmentally caused. The mentally ill, and even the alcoholic or other drug abuser, may have difficulty learning or transferring learning to new settings. The problem can be slow learning or distorted thought and perception.

Example: the mentally retarded.

5. Social-attitudinal functions. If impaired, the person cannot accept himself and his abilities, has difficulty relating to other people, or is not motivated to improve himself as a member of the community or labor force. Impairments may also include deficiencies in "coping skills" which involve recognizing one's self interest and maximizing them within the constraints set by society. Although impairment in this area my be directly caused by society's intolerance or misconceptions, the concern is only with the way the disabled person feels about himself and related to others--whatever the cause. This type of impairment may be especially severe for those who suffer a loss due to injury or disease after childhood.

Example: schizophrenia

The summary statements included in each disability subsection make reference to needs of persons with this disability, and draw comparisons between needs in a given life function and technologies in that life function. The needs analysis was done as a separate part of the project, and utilized in this section to provide a framework in which to summarize the technologies. The reader is referred to Report #3 which describes the needs analysis and presents the needs constellation tables.

RESEARCH NOTES

Note 1: In the tables that follow, some life functions have no technologies listed. This is due to the fact that in the survey of literature, no technologies were found for that disability which were utilized to overcome problems in that life function. This can be due to several reasons:

1. No real problems exist in that life function. This is a viable argument for some disabilities such as Deaf/Hearing Impaired, in which no technologies were found in the Health Life function. It is reasonable to expect that the distribution of health problems in the deaf population is no different from the hearing population, and that no specific health problems accrue from the fact that a person is deaf.
2. There may be technologies lurking in the literature which were not located. This will be readily obvious to any reader who has specialized knowledge of the disabilities surveyed. In these cases, the lack of entries should be viewed as representative of the proportion of technologies applied to that life function compared to technologies in other life functions.
3. In some cases, the Needs analysis--a compilation of statements of needs compiled from a different literature search, indicate needs in some life functions for which no technologies are listed in this report. This should be viewed one of two ways:
    a. Technologies do exist to meet these needs which were not found in the literature.
    b. Some needs exist which are not being met by technology. This is an especially fruitful way of looking at the problem as it points to specific areas in which applied research is needed.

Note 2: The authors recognize, and the reader should be aware that much research and technology is aimed at prevention of disability. This is an extremely crucial area and includes such technologies as: early diagnosis, genetic counseling, dietary research, and early intervention. These technologies are discussed in the individual disability reports which form another part of this project report. These technologies are as equally important as the technologies discussed herein, however, as this report deals with rehabilitation technologies, i.e., those that are employed after the disability is present, the technologies of prevention are not within the scope of this effort.

SUMMARY

This report represents an initial attempt to organize the enormous amount of information pertaining to disabilities and the technologies available for their treatment. While a great deal of effort was expended to make this investigation as accurate as possible, limitations are inevitably present in any interpretation of the results obtained. Notes in the introduction explain more clearly what these limitations are. There are, however, several new and important steps which have been taken in this project. The first of these is the definition of "technologies" as they apply to the types of disabilities chosen for study. The second is the organization of specific techniques as much as possible into technologies which not only share a common thread but also differ in some significant way from other technologies. A third step is the organization of technologies and disabilities in relation to the aspects of life that they affect--health, mobility, communication, social-attudinal and cognitive-intellectual. Fourth is the separation of the search for literature pertaining to needs in the various disabilities and investigation of technologies which exist to meet those needs. A final step is the grouping of the different technologies into categories according to their characteristics as physical intervention, training/counseling, or environmental change. Taken together, these steps provide an organizing and classifying scheme which can be used by researchers in the future as a guideline. It is hoped that this initial attempt at sorting out this vast collection of data will ultimately lead to improvement and elaboration of its findings by others in the field.

TECHNOLOGIES APPLIED TO SPINAL CORD INJURY

Among persons disabled by spinal cord injury, major needs are fairly equally divided among the health, mobility, and social-attitudinal life functions. Specific health needs are very diverse. Mobility needs primarily involve obvious problems associated with paralysis and interference with physical locomotion. Social-attitudinal needs are also very diverse, including many problems associated with isolation and withdrawal, dependency, frustration, and difficulties in sexual relations. No distinctive communication or cognitive-intellectual needs are reported for persons disabled by spinal cord injury.

The distribution of technologies for dealing with the life-function needs of persons disabled by spinal cord injury is similar to the distribution of needs among these persons, except that few technologies for dealing with social-attitudinal needs are reported in research sources, whereas several communication technologies are reported. Technologies for dealing with health needs include drug therapy, surgical procedures, physical therapy, orthopedic devices, and catheterization techniques. The major technologies for dealing with mobility needs include orthotic and prosthetic devices and adaptive equipment such as wheelchairs and hand controls for automobiles. Technologies for dealing with social-attitudinal needs include occupational therapy, counseling, and psychotherapy. Although the total number of technologies for dealing with social-attitudinal needs is small, these are broad technologies encompassing a variety of specialized techniques. The disproportionately high percentage of communication technologies is due primarily to the inclusion within this category of numerous very specialized types of adaptive equipment, which are used to offset the disabling effects of paralysis and which are also included in the mobility category.

The list of technologies applied to spinal cord injury is given in table 4-1.

TABLE 4-1
LIST OF TECHNOLOGIES APPLIED TO SPINAL CORD INJURY

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
Health	Drug Therapy			
	Drug treatment of pressure sores	X		
	Drug treatment of spasms (Glass, 1975)	X		
	Urinary antiseptics (Felton, Perkins, & Levin)	X		
	Surgical Procedures			
	Surgical treatment of pressure sores	X		
	Muscle rebalancing (J. Bone & Joint Surgery)	X		
	Surgical lengthening of muscles	X		
	Surgery in the bladder	X		
	Neurotomy (division of nerves)	X		
	Physical Therapy			
	Calipers to stretch muscles & tendons	X		
	Exercise to prevent stone formation	X		
	Education			
	Teaching bowel & bladder control techniques (Felton, Perkins & Levin)		X	
	Antipyretic Measures (To control fever outbreaks which result from impaired body temperature control) (Felton, Perkins & Levin)	X		
	Dietary Management			
	Regimens of high water ingestion to reduce formation of kidney stones (Felton, Perkins, & Levine)	X		

TABLE 4-1
LIST OF TECHNOLOGIES APPLIED TO SPINAL CORD INJURY (CONTINUED)

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
	Diet high in protein content (Felton, Perkins, & Levine)	X		
	Orthopedic Devices			
	Stryker frame (Hardy & Elson, 1976)	X		
	Stoke mandeville egerton bed (Hardy & Elson, 1976)	X		
	Kean Roto rest bed (Hardy & Elson, 1976)	X		
	Lodge Moor frame (Hardy & Elson, 1976)	X		
	"Monkey Pole" (Hardy & Elson, 1976)	X		
	Catheterization			
	Indwelling catheter	X		
	Ileal loop	X		
	External catheters (Male)	X		
Mobility	Orthotic Devices			
	CO$_2$ powered arm orthesis (Engen, 1969)	X		
	Reciprocal wrist extension finger flexion orthesis (Goldfinger & Goodgold, 1975)	X		
	Exoskeletal devices to limit or assist motion of any segment of the body (Goldfinger & Goodgold, 1975)	X		
	Thigh-knee-ankle orthesis (Lehnesis, 1972)	X		
	Short leg braces (Goldfinger & Goodgold, 1975)	X		

TABLE 4-1
LIST OF TECHNOLOGIES APPLIED TO SPINAL CORD INJURY (CONTINUED)

Life Function	Technology Technique	Technology Category PI	TC	EC
	Electric multi-axis device to drive arm (Long, 1971)	X		
	Ankle-foot orthesis (CPRD, 1972c)	X		
	Hydraulically operated elbow orthesis (Heather, 1962)	X		
	Michigan feeder (Rae, 1961)	X		
	Electrically powered hand spling (Potter, 1971)	X		
	Long leg brace system (Scott, 1971)	X		
	Rancho Electro arm and tongue switch control (Nickel, 1968)	X		
	Prosthetic Devices			
	Upper extremity control base (Ilanit)	X		
	The McKibben artificial muscle (Braided fluid actuator) (Rae, 1961)	X		
	Externally powered artificial arm (Lynam, 1970)	X		
	Adaptive Equipment			
	Electric wheelchair (Nickel, 1968)	X		
	Stair climbing wheelchair (Zudans, 1971)	X		
	Reduced gravity simulator (Vallbona, 1970)	X		
	Hand controls for automobiles (Goldfinger & Goodgold, 1975)	X		

TABLE 4-1
LIST OF TECHNOLOGIES APPLIED TO SPINAL CORD INJURY (CONTINUED)

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
	Surgical Technique			
	Peripheral Nerve Grafting	X		
	Physical Therapy			
	Precept-Concent-Motor training therapy		X	
Communication	Adaptive Equipment			
	Communication terminal for the loss of speech (Vande, 1975	X		
	Dual purpose telephone (Vande, 1975)	X		
	ANROWD (Alpha Numeric Readout Display) Vande, 1975	X		
	Code operated selector (COS) (Vande, 1975)	X		
	COMHANDI (Vande, 1975	X		
	Alphabet message scanner (Vande, 1975)	X		
	Code-com set telephone aid (Vande, 1975)	X		
	Auto-com (Vande, 1975)	X		
	Automatic dialing telephone (Vande, 1975)	X		
	TV phone (Vande, 1975)	X		
	Tongue controlled typewriter (Vande, 1975)	X		
	MCM communication system (Vande, 1975)	X		
	View com^{TM} (Vande, 1975)	X		

TABLE 4-1
LIST OF TECHNOLOGIES APPLIED TO SPINAL CORD INJURY (CONTINUED)

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
	VAPC communicator (Vande, 1975)	X		
	Keyboard operated wall display (Vande, 1975)	X		
	Electromechanical device (Vande, 1975)	X		
	Eye-controlled teletypewriter (Vande, 1975)	X		
	Dvorak one hand typewriter (Vande, 1975)	X		
Social/ Attitudinal	Occupational Therapy (Hardy & Elson, 1976)		X	
	Counseling & Psychotherapy (Hardy & Elson, 1976)		X	
Cognitive/ Intellectual	None - See Note 1			

TECHNOLOGIES APPLIED TO STROKE

Among persons disabled by stroke, the life-function area in which the greatest number of needs occur is mobility. Needs are reported in all but two of the 17 specific categories of mobility needs. Specific mobility needs result from paralysis, difficulties in fine motor control, interference with voluntary movements, tonal abnormalities, and atrophy and weakening of muscles. These needs are predictable, because stroke almost invariably leads to some degree of paralysis. All techniques for dealing with the mobility needs of persons disabled by stroke fall in the category of physical intervention. Included among these techniques are several types of orthotic devices, prosthetic devices, and adaptive equipment.

Persons disabled by stroke also have a large number of health needs. These needs are associated primarily with sensation discomforts and interference with sensation, generalized tissue disorders, brain disorders, and difficulties in ventilation. The health life-function contains 16 percent of the total techniques for dealing with problems of persons disabled by stroke. Specific techniques include various forms of physical therapy and drug therapy to increase or maintain blood circulation.

Social-attitudinal needs of persons disabled by stroke are nearly as numerous as health needs. These needs are widely distributed among the specific categories of social-attitudinal needs, with the most prominent involving depression, loss of self-esteem, psychotic disturbances, anxiety, frustration and bitterness at the condition, and irritability and lapses in tact. The social-attitudinal life function, however, contains only 6 percent of the total techniques for dealing with problems associated with stroke. Specific techniques for dealing with social-attitudinal problems include psychotherapy, vocational placement, and control of spasticity through "deafferentiation." Psychotherapy and vocational placement, however, are wide-ranging technologies encompassing a variety of specialized therapies and programs.

Although the communication life-function is often impaired among persons disabled by stroke, this life-function contains a disproportionate percentage (45 percent) of the total techniques for dealing with problems associated with stroke. This apparent discrepancy is partially attributable to the plethora of techniques associated with very specific types of adaptive equipment such as eye- and tongue-controlled typewriters, telephone aids, and communication systems.

Cognitive-intellectual needs account for only a tiny percentage--8 percent--of the total needs of persons disabled by stroke. Needs in this life function relate primarily to problems in reasoning and thought processes. Techniques for dealing with these problems include special education and memory aids.

The list of techologies applied to stroke is given in table 4-2.

TABLE 4-2
LIST OF TECHNOLOGIES APPLIED TO STROKE

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
Health	Physical Therapy			
	Breathing exercises (Weiss, 1976)		X	
	Tilting of bed for adequate ventilation (Weiss, 1976)	X		
	Heat, massage, and stretching to treat deformities (Diller, 1973)	X		
	Drug Therapy			
	Hypertensive control (Cohen, 1975)	X		
	Anti-coagulants (Cohen, 1975)	X		
	Auto regulation (Cohen, 1975)	X		
	Vasodilation (Cohen , 1975)	X		
	Biomedical Electronic Devices			
	Holter monitor (Clipper, 1975)	X		
Mobility	Prosthetic Devices			
	Upper extremity control base (Ilanit)	X		
	The McKibben artificial muscle (Braided fluid actuator) (Rae, 1961)	X		
	Externally powered artificial arm (Lynam, 1970)	X		
	Orthotic Devices			
	Michigan feeder (Rae, 1961)	X		

TABLE 4-2
LIST OF TECHNOLOGIES APPLIED TO STROKE (CONTINUED)

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
	Hydraulically operated elbow orthesis (Heather, 1962)	X		
	Electrically powered hand splint (Potter, 1971)	X		
	Long leg brace system (Scott, 1971)	X		
	Rancho electric arm and tongue switch control (Nickel, 1968)	C		
	Adaptive Equipment			
	Stair-climbing wheelchair (Zudans, 1971)	X		
	Electric wheelchair (Nickel, 1968)	X		
	Reduced gravity simulator (Vallbova, 1970)	X		
	Physical Therapy			
	Percept-concept motor training therapy (Shaeffer, 1970)		X	
	Surgical Procedures			
	End organ surgery (Freed, 1975)	X		
	Lower and upper extremity correction (Freed, 1975)	X		
Communication	Adaptive Equipment			
	Communication terminal for the loss of speech (Vande, 1975)	X		
	Dual-purpose telephone (Vande, 1975)	X		
	ANROWD (Alpha Numeric Readout Display) (Vande, 1975)	X		

TABLE 4-2
LIST OF TECHNOLOGIES APPLIED TO STROKE (CONTINUED)

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
	Code operated selector (COS) (Vande, 1975)	X		
	COMHANDI (Vande, 1975)	X		
	Alphabet message scanner (Vande, 1975)	X		
	Code-Con set telephone aid (Vande, 1975)	X		
	Auto-Com (Vande, 1975)	X		
	Automatic dialing telephone (Model ADT-5A) (Vande, 1975)	X		
	TV phone (Vande, 1975)	X		
	Tongue controlled typewriter (Vande, 1975)	X		
	MCM communication system (Vande, 1975)	X		
	View Com™ (Vande, 1975)	X		
	VAPC communicator (Vande, 1975)	X		
	Keyboard operated wall display (Vande, 1975)	X		
	Electromechanical device (Vande, 1975)	X		
	MC 6400 communicator (Vande, 1975)	X		
	Electronic readout spelling machines (Vande, 1975)	X		
	Eye-controlled teletypewriter (Vande, 1975)	X		

TABLE 4-2
LIST OF TECHNOLOGIES APPLIED TO STROKE (CONTINUED)

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
	Dvorak one-hand typewriter (Vande, 1975)	X		
	Speech Therapy (Weiss, 1976)		X	
	Use of wives as speech therapists (Diller, 1973)		X	
Social/ Attitudinal	Psychotherapy (Weiss, 1976)		X	
	Control of spasticity through "deafferentiation" (Weiss, 1976)	X		
	Vocational Placement Programs (Diller, 1973)		X	
Cognitive/ Intellectual	Special Education (Weiss, 1976)		X	
	Memory Aids (Weiss, 1976)		X	

TECHNOLOGIES APPLIED TO CEREBRAL PALSY

Among persons disabled by cerebral palsy, the life-function areas in which most needs are concentrated are mobility (44 percent) and communication (30 percent). Mobility needs of persons disabled by cerebral palsy primarily involve interference with voluntary movements, excessive involuntary movements, postural abnormalitites, and gait problems. Communication needs of persons disabled by cerebral palsy primarily involve eye muscle abnormalities, articulation and other speech abnormalities, vocalization disturbances due to muscle dysfunction or paralysis, and blindness and refractory-related errors.

Technologies for dealing with life-function needs of persons disabled by cerebral palsy are likewise concentrated in the areas of mobility and communication. Techniques for dealing with mobility problems account for 60 percent of the total techniques for dealing with needs of persons with cerebral palsy, and techniques for dealing with communication needs account for 27 percent of the total. Specific techniques for dealing with mobility problems include neuro-surgical procedures, drug therapy, orthotic devices such as braces and splints, and sensory-motor training. Specific techniques for dealing with communication problems include various speech therapies and communication aids or devices.

Health needs of persons disabled by cerebral palsy account for only a small percentage of the total needs expressed.

Specifically these needs involve sensation discomforts and interference with sensation, and fatigue and sleep disturbances. However, research sources reveal no technologies for dealing with these needs.

Cognitive-intellectual needs of persons disabled by cerebral palsy also make up only a small percentage of the total needs associated with this disability. These needs specifically involve sensory receptivity difficulties, stimulus processing difficulties, thinking and reasoning difficulties, depressed performance on IQ tests, and pathological thought processes. Only one technology for dealing with these problems is revealed in research sources. However, this technology, education, is very wide-ranging and includes a variety of specialized techniques.

Social-attitudinal needs of persons disabled by cerebral palsy include feelings of social isolation, withdrawal and fear of relationships, and depression. The technology for dealing with these problems is psychotherapy.

A list of the technologies applied to cerebral palsy is given in table 4-3.

TABLE 4-3
LIST OF TECHNOLOGIES APPLIED TO CEREBRAL PALSY

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
Health	None - See Note 1			
Mobility	Orthotic Devices			
	Splints & braces (McCarrol, 1972; Wilson, 1973)	X		
	Surgical Procedures			
	Brain surgery to relieve symptoms (Denoff, 1972)	X		
	Therapeutic brain lesions (electric stimulation) (Wilson, 1972)	X		
	Surgery to prevent deformity (Wilson, 1973; McCarrol, 1972)	X		
	Physical Therapy			
	Special exercise equipment & programs (Phelps, 1963)	X	X	
	Education			
	"Sensory Story" Technique (Increase use and awareness of limbs) (Barret & Jones, 1967)		X	
	Sensory-motor learning techniques (Bobarth & Bobarth, 1967)		X	
	Learning of body postures to improval functional abilities (Bobarth & Bobarth, 1952)		X	
	Drug Therapy			
	Use of drugs in treatment (Denoff, 1972)	X		
Communication	Speech Therapy			
	Language boards; picture boards; word & phrase boards (McDonald & Schulz, 1973)		X	

TABLE 4-3
LIST OF TECHNOLOGIES APPLIED TO CEREBRAL PALSY (CONTINUED)

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
	Multiple sense modality approach (Kirk, 1972)		X	
	Early treatment for speech defects (Hull & Hall, 1972)		X	
	Communication Devices			
	Non-verbal electronically mediated communication (Larson, 1971; Jones, 1961)	X		
Social/ Attitudinal	Psychotherapy			
	Psychiatric practices with the cerebral palsied (Allen & Jefferson, 1962)		X	
Cognitive/ Intellectual	Education			
	Cerebral palsy unit (Mullafereze, 1970)		X	

TECHNOLOGIES APPLIED TO EPILEPSY

Among persons disabled by epilepsy, life-function needs are concentrated in the areas of health, social-attitudinal functioning, and cognitive intellectual functioning (25 to 31 percent each), with a low percentage of needs in the mobility and communication areas. Specific health needs are widely distributed among 16 different need areas, with emphasis on sleep disturbances, skin disorders, and blood disorders. Social-attitudinal needs are broad and comprehensive. Cognitive-intellectual needs relate primarily to decreased performance on standard IQ tests, deficits in reasoning and thought processes, decreased academic performance, and learning difficulties.

Technologies available for meeting the health, social-attitudinal, and cognitive-intellectual needs of persons disabled by epilepsy do not seem to correlate well with needs in these areas. The health life-function contains the largest number of technologies, but these technologies are, for the most part, aimed directly at controlling seizures rather than at the alleviating wide array of complications frequently associated with them. Only one available technology described in research sources deals with numerous social-attitudinal needs. However, presumably despite the lack of specific references to the use of psychotherapeutic techniques among epileptics, these techniques are used for persons in this group. No technologies dealing with cognitive-intellectual needs of epileptics are described in research sources. This lack, coupled with the pervasiveness of needs in this area, perhaps represents a real need for new technologies for dealing with these problems.

Mobility needs associated with epilepsy include specific physical locomotion difficulties such as paralysis, weakening of muscles, and balance problems. Technologies for dealing with these problems include primarily techniques for directly eliminating seizures and thus increasing the mobility of the disabled person.

The list of technologies applied to epilepsy is given in table 4-4.

TABLE 4-4
LIST OF TECHNOLOGIES APPLIED TO EPILEPSY

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
Health	Drug Therapy			
	Anticonvulsants (Phenobarbitol, Diphenylgydantoin, Valium, etc.) (Solomon & Plum, 1976)	X		
	Surgical Procedures			
	Removal of epileptic focus (Solomon & Plum, 1976)	X		
	Hemispherectomy (Solomon & Plum, 1976)	X		
	Collosal commissurotomy (Solomon & Plum, 1976)	X		
	Stereotactic ablation (Selected diencephalic areas) (Solomon & Plum, 1976)	X		
	Cerebellum stimulation (Solomon & Plum, 1976)	X		
Mobility	Surgical Procedures			
	Stereotaxic surgery (Adams, 1968)	X		
	Biomedical Electronic Devices			
	Automatic electrical device (Small subject mounted telemetry package) (Vigilione, 1971)	X		
Communication	None - See Note 1			
Social/ Attitudinal	Psychotherapy			
	"First-Aid" psychotherapy (Lennox, 1960)		X	
Cognitive Intellectual	None - See Note 1			

TECHNOLOGIES APPLIED TO MENTAL RETARDATION

Among persons disabled by mental retardation, the most important life-function needs are in the areas of cognitive-intellectual functioning, social-attitudinal functioning, and communication. Cognitive-intellectual and social-attitudinal needs are predictable according to the definition of mental retardation as a deficit in intellectual functioning and adaptive behavior. Communication needs are also predictable because of the close correlation between communication skills and intellectual functioning. Techniques for dealing with the needs associated with mental retardation are most numerous in the cognitive-intellectual category. These techniques generally involve education and training. Techniques for dealing with social-attitudinal needs make up the second most numerous group of techniques (27 percent), followed closely by techniques for dealing with communication needs (24 percent). Specific techniques for dealing with social-attitudinal needs consist primarily of academic and vocational education. Techniques for dealing with communication needs consist primarily of language- and reading-skills programs.

Health and mobility needs of persons disabled by mental retardation account for only a small percentage of the total needs of this group. However, technologies for meeting health and mobility needs of mentally retarded persons make up a disproportionately small percentage of the total technologies. Health needs of mentally retarded persons are primarily associated with physical deformity, brain disorders, and threats to normal system functioning. However, only 4 percent of the total techniques for dealing with mental retardation fall in the health category. Similarly, although mentally retarded persons have a wide variety of mobility needs, primarily associated with kinesthetic motor reactions, fine motor control, and inability or limited ability to walk, only 2 percent of the total techniques for dealing with mental retardation are in the mobility category.

Overall, techniques for dealing with the problems associated with mental retardation are almost exclusively training and counseling techniques, in contrast to techniques for dealing with other disabilities, which involve more physical intervention or environmental change.

The list of technologies applied to mental retardation is given in table 4-5.

TABLE 4-5
LIST OF TECHNOLOGIES APPLIED TO MENTAL RETARDATION

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
Health	Physical Fitness Training (Milligan, 1976)		X	
	Training for Medical Emergencies (Wilkie, 1975)		X	
Mobility	Removal of Architectural Barriers			
	Sheltered workshops (an architectural guide) (Salmon, 1966)			X
Communication	Language Skill Training			
	Language training program (Ziebert, 1971)		X	
	Language training program (Odon & Pouios, 1971)		X	
	Language Skill Training			
	Direction following program (Brown *et al*., 1973)		X	
	Location concept program (Brown *et al*., 1973)		X	
	Receptive language program (Brown *et al*., 1973)		X	
	Expressive language program (Brown *et al*., 1973)		X	
	Reading Skills Training			
	Initial sight work reading program (Brown *et al*., 1973)		X	
	Color program (Brown *et al*., 1973)		X	
	Basic alphabet skill program (Brown *et al*., 1973)		X	
	Chart story program (Brown *et al*., 1973)		X	

TABLE 4-5
LIST OF TECHNOLOGIES APPLIED TO MENTAL RETARDATION (CONTINUED)

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
	Pre-writing program (Brown *et al*., 1973)		X	
	Shape, discrimination and labeling program (Brown *et al*., 1973)		X	
Social/ Attitudinal	Education			
	Automated instruction (Platt, 1966)		X	
	Special education (Baske, 1970)		X	
	Vocationally oriented four year secondary school (Goodman, 1972)		X	
	Vocational Training			
	Industrial training resources program (Bakonovich, 1971)		X	
	Sheltered workshop (Salmon, 1966)		X	X
	Vocationally oriented four year secondary school (Goodman, 1972)		X	
	Sheltered workshops (Mezof, 1969)		X	
	Coordinated program of vocational rehabilitation and special education (Baske, 1970)		X	
	Task analysis techniques (Gold,1972; Martin & Flexer, 1975)		X	X
	Independent Living Training			
	Independent living rehabilitation program (Bourgue, 1965)		X	
	Social perceptual training (Leach & Edmonson, 1967)		X	

TABLE 4-5
LIST OF TECHNOLOGIES APPLIED TO MENTAL RETARDATION (CONTINUED)

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
	Money management training program (Flexer, 1976)		X	
Cognitive/ Intellectual	Language Training			
	Language training program (Odon & Povious, 1971)		X	
	Language training (Ziebert, 1971)		X	
	Education			
	Coordinated program of vocational rehabilitation and special education for the mentally retarded (Baske, 1970)		X	
	Non-verbal symbolic picture logic (Milgram, 1971)			
	Educational rhythmics (Arje, 1966)		X	
	Automated instruction (Platt, 1966)		X	
	Number discrimination and labeling program (Brown et al., 1973)		X	
	Basic counting and quantity concept program (Brown et al., 1973)		X	
	Rudimentary math concepts program (Brown et al., 1973)		X	
	Vocational training (Wilson, 1968)		X	
	Vocational training center (Wilson, 1968)		X	
	Automated instructions (Platt, 1966)		X	
	Multidimensional vocation rehabilitation program (Baxt, 1971)		X	

TABLE 4-5
LIST OF TECHNOLOGIES APPLIED TO MENTAL RETARDATION (CONTINUED)

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
	Skill analysis techniques (Viscardi, 1976)		X	
	Social Skills Training			
	Independent living rehabilitation program (Katz, 1966)		X	

TECHNOLOGIES APPLIED TO SCHIZOPHRENIA

Among persons disabled by schizophrenia, life-function needs are concentrated in the areas of communication, social-attitudinal functioning, and cognitive-intellectual functioning and are relatively evenly distributed among these three areas. Difficulties in communication primarily involve classical psychotic symptoms of distorted perception, including hallucinations and bizarre speech patterns. Social-attitudinal problems related to schizophrenia primarily involve withdrawal, dependency, and immaturity in social relationships, and difficulties stem mainly from bizarre thought processes and attentional lapses caused by distractions and hallucinations.

Technologies for dealing with needs arising from schizophrenia are most numerous within the social-attitudinal and cognitive-intellectual areas. Most of the technologies available for dealing with social-attitudinal and cognitive-intellectual needs of schizophrenics involve drug therapy along with various psychotherapies and milieu therapies such as halfway houses. Older treatments which are still in use include psychosurgery, insulin shock therapy, and electroconvulsive shock therapy. Vocational preparation and training also appear as technologies aimed at minimizing social-attitudinal and cognitive-intellectual problems.

Currently, only one technology, anti-psychotic drug therapy, is available for dealing with thought and speech disturbances which create communication needs.

The list of technologies applied to schizophrenia is given in table 4-6.

TABLE 4-6
LIST OF TECHNOLOGIES APPLIED TO SCHIZOPHRENIA

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
Health	Monitoring			
	Halfway house services (See Social Attitudinal Life Function)		X	X
	Hospitalization (Solomon, 1965)	X	X	X
	Daycare center (Livingstone, 1964) (See Social Attitudinal Life Function)		X	X
Mobility	None			
Communication	Drug Therepy (See Cognitive-Intellectual and Social Attitudinal Life Functions)			
	Insulin therapy (Solomon, 1965)	X		
	Major tranquilizers (Solomon, 1965)	X		
	Megavitamin therapy (Solomon, 1965)	X		
Social/ Attitudinal	Physical Therapy			
	Stretch relaxation exercises (Boruchov, 1965)		X	
	Therapeutic pool program (Milbank, 1965)		X	
	Psychosurgery			
	Lobotomization (Solomon, 1965)	X		
	Electrophysical Therapy			
	Electroconvulsive shock therapy	X		

TABLE 4-6
LIST OF TECHNOLOGIES APPLIED TO SCHIZOPHRENIA (CONTINUED)

Life Function	Technology Technique	Technology Category		
		PT	TC	EC
	Psychotherapies			
	Multiple family therapy (Lacquicui, 1971)		X	
	Individual psychotherapy (Solomon, 1965)		X	
	Community mental health center (Schlessinger, 1968)		X	
	Behavior therapy (Solomon, 1965)		X	
	Drug Therapy (See Cognitive-Intellectual and Communication Life Functions)			
	Insulin therapy (Solomon, 1965)	X		
	Major tranquilizers (Solomon, 1965)	X		
	Megavitamin therapy (Solomon, 1965)	X		
	Social Environment Therapy			
	Social therapeutic club (Grobb, 1965)		X	
	Halfway house services (See Health Life Function)		X	X
	Daycare center (Livingstone, 1964) (See Health Life Function)		X	X
	Vocational Training and Counseling			
	Vocational group therapy (Newman, 1963)		X	
	Vocational adjustment center (Oseas)		X	

TABLE 4-6
LIST OF TECHNOLOGIES APPLIED TO SCHIZOPHRENIA (CONTINUED)

Life Function	Technology Technique	Technology Category PI	TC	EC
	Evaluation and adjustment center for the emotionally disturbed (Danie, 1966)		X	
	Occupational adjustment center (Milano, 1963)		X	
Cognitive/ Intellectual	Vocational preparation			
	Work conditioning program (Rice, 1966)		X	
	Home economics training (Katerynuik, 1962)		X	
	Educational rhythmics (Arje, 1966)		X	
	Vocational clinic for the emotionally disturbed (Osterhok, 1967)		X	
	Drug Therapy (See Social Attitudinal and Communication Life Functions)			
	Insulin therapy (Solomon, 1965)	X		
	Major tranquilizers (Solomon, 1965)	X		
	Megavitamin therapy (Solomon, 1965)	X		

TECHNOLOGIES APPLIED TO RHEUMATOID ARTHRITIS

Among persons disabled by rheumatoid arthritis, life-function needs are most numerous (47 percent) in the area of health. Specific health needs are very diverse, with the most frequently mentioned involving sensation discomforts and interference with sensation, skin disorders, generalized tissue disorders, and threats to normal system functioning. The health life-function, however, accounts for a disproportionately small percentage (25 percent) of techniques for meeting the needs of persons disabled by rheumatoid arthritis. The most numerous techniques for meeting health needs involve physical therapy or drug therapy, but radiotherapy, surgery, and orthotic devices are also used.

The social-attitudinal life function accounts for the second highest percentage (25 percent) of needs among persons disabled by rheumatoid arthritis. Specific social-attitudinal needs involve frustration and anger at the disability, aggressiveness and hostility, and dependency conflicts. The only technology for dealing with these needs, however, is self-care devices which reduce feelings of dependency. Although several different types of self-care devices are included in this single technology, it appears that this technology is not adequate for meeting all of the social-attitudinal needs of persons disabled by rheumatoid arthritis.

The mobility life function accounts for only slightly fewer (24 percent) of the total needs of persons disabled by rheumatoid arthritis than does the social-attitudinal life function. Specific mobility needs of persons in this group involve joint problems, limitations of activities in the home, and difficulties in fine motor control. However, a disproportionately high percentage of techniques for meeting needs associated with rheumatoid arthritis are in the mobility life function. This discrepancy is largely due to the specificity of many of these techniques. Specific techniques include many different types of orthotic and prosthetic devices such as braces, artificial joints and limbs, drug therapy, and physical therapy.

Although communication needs account for only a very small percentage (4 percent) of the total needs of persons disabled by rheumatoid arthritis, no specific technologies are available for meeting these needs. Ocular diseases account for most of these communication problems.

No needs of technologies in the cognitive-intellectual areas are reported for persons disabled by rheumatoid arthritis, presumably because this disease does not impair cognitive-intellectual functioning.

The list of technologies applied to rheumatoid arthritis is given in table 4-7.

TABLE 4-7
LIST OF TECHNOLOGIES APPLIED TO RHEUMATOID ARTHRITIS

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
Health	Physical Therapy			
	Paraffin applications (Moskowitz, 1975) (See Mobility Life Function)	X		
	Hydrotherapy (Moskowitz, 1975) (See Mobility Life Function)	X		
	Hubbard tank therapy (Moskowitz, 1975) (See Mobility Life Function)	X		
	Surgical Procedures			
	Prophglactic synovectomy (juvenile) (Journal of American Medical Association, 1970)	X		
	Osteotomy (Corentry, et al., 1965)			
	Synovectomy (Clayton, et al., 1973)	X		
	Arthroplamis - fetal joint replacements (Journal of Bone and Joint Surgery, 1971)	X		
	Muscle rebalencing	X		
	Occupational Therapy			
	Tomis projection	X		
	Adaptive equipment	X		
	Environmental changes	X		
	Orthotic Devices			
	Splints (Moskowitz, 1975) (See Mobility Life Function)	X		

TABLE 4-7
LIST OF TECHNOLOGIES APPLIED TO RHEUMATOID ARTHRITIS (CONTINUED)

Life Function	Technology Technique	Technology Category PI	TC	EC
	Drug Therapy			
	Corticosteroid preparations (Moskowitz, 1975) (See Mobility Life Function)	X		
	Immunosuppressive drugs (Moskowitz, 1975) (See Mobility Life Function)	X		
	Chrysotherapy (Gold salts) (Moskowitz, 1975) (See Health Life Function)	X		
	Non steroidal anti-inflammatory agent (Smyth, 1975)	X		
	Radio Therapy			
	Radioactive agents (Moskowitz, 1975) (See Mobility Life Function)	X		
Mobility	Orthotic Devices			
	Cast brace (Mooney, 1970)	X		
	Dynamic ulna-deviation splint (Rae, 1967)	X		
	Short leg brace (Inman, 1965)	X		
	Splints (Moskowitz, 1975) (See Health Life Function)	X		
	Foot appliances (Moskowitz, 1975)	X		
	Cervical collars (Moskowitz, 1975)	X		
	Back supports (Moskowitz, 1975)	X		
	Steel cable knee joint (Bechtol, 1967)	X		

TABLE 4-7
LIST OF TECHNOLOGIES APPLIED TO RHEUMATOID ARTHRITIS (CONTINUED)

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
	Sacro-iliac support (Bechtol, 1967)	X		
	Prosthetic Devices			
	Endoskeletal artificial arm (Bechtol, 1968)	X		
	Metallic prosthetic joint (Flah, 1966)	X		
	Multiple-axis myoelectrically controlled prosthetic arm (Wirta, 1970)	X		
	Cybernetics approach (Feedback System for prosthetic devices) (Smith, 1971)	X		
	Solid ankle cushioned heel feet (Sach)	X		
	Patellar tendon bearing below knee socket	X		
	Physical Therapy			
	Paraffin applications (Moskowitz, 1975) (See Health Life Function)	X		
	Hydrotherapy (Moskowitz, 1975) (See Health Life Function)	X		
	Hubbard tank therapy (Moskowitz, 1975) (See Health Life Function)	X		
	Drug Therapy			
	Corticosteroid preparations (Moskowitz, 1975) (See Health Life Function)	X		
	Immunosuppressive drugs (Moskowitz, 1975) (See Health (Life Function)	X		

TABLE 4-7
LIST OF TECHNOLOGIES APPLIED TO RHEUMATOID ARTHRITIS (CONTINUED)

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
	Chrysotherapy (Gold salts) (Moskowitz, 1975) (See Health Life Function)	X		
	ACTH (Adrenal corticophin) (Moskowitz, 1975) (See Health Life Function)	X		
	Radio Therapy			
	Radioactive agents (Moskowitz, 1975) (See Health Life Function)	X		
	Adaptive Equipment			
	Wheelchair life (Elevator) (Yuker, 1966)			X
	Stair climbing wheelchairs (Zudans, 1971)	X		X
	Self-care devices (Moskowitz, 1975) (See Social/Attitudinal Life Function)	X		X
Communication	None - See Note 1			
Social/ Attitudinal	Adaptive Equipment			
	Self-care devices (Moskowitz, 1975)	X		X
Cognitive/ Intellectual	None - See Note 1			

TECHNOLOGIES APPLIED TO CORONARY HEART DISEASE

Among persons disabled by coronary heart disease, half of the needs are in the social-attitudinal area. Prominent among social-attitudinal needs are ways of dealing with the frustration, confusion, and anger at the condition or, conversely, denial and minimization of the disability. The main technologies for dealing with social-attitudinal needs are psychological and vocational counseling.

The life-function area containing the second highest number of needs is health, with one third of the total. Specific needs within this life function involve cardiovascular impairment and restriction of sexual activity. Technologies aimed at ameliorating these problems are disproportionately numerous, representing 80 percent of the total number of technologies applied to coronary heart disease. Foremost among the technologies for dealing with health problems are various types of surgical procedures, educational and supportive services, drug therapy, exercise programs, and dietary control.

The only other life-function in which needs are reported is mobility. Specific mobility problems relate to limitations in physical exertion and difficulties in driving a car. The technologies for dealing with mobility problems represent 8 percent of the total and consist exclusively of physical therapies such as reconditioning and exercise programs.

The list of technologies applied to coronary heart disease is given in table 4-8.

TABLE 4-8
LIST OF TECHNOLOGIES APPLIED TO CORONARY HEART DISEASE

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
Health	Surgical Procedures (Transplantation)			
	Cardiac transplantation	X		
	Surgical Procedures (Reconstruction)			
	Myocardial revascularization (Russek & Zohman, 1971)	X		
	Endaterotomy (Patch-graft reconstruction)	X		
	Surgical Procedures (Prosthetic Devices)			
	The artificial heart (de Bakey, Liotta, & Hall, 1966)	X		
	Intra-aortic balloon counter pulsation (IABC)	X		
	Surgical Procedures (Bioelectric Devices)			
	Pace maker implant (Baker, 1966)	X		
	Synchronized direct current electric shock (Rubin, *et al.*, 1972)	X		
	Educational and Supportive Services			
	Coronary Care Family Conference		X	
	CHD Teaching Evaluation Form		X	
	Homemaker services (Jefferson, 1966)		X	
	Family counseling for families of stroke patients (Overs, 1971)		X	

TABLE 4-8
LIST OF TECHNOLOGIES APPLIED TO CORONARY HEART DISEASE (CONTINUED)

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
	Drug Therapy			
	Colesterol lowering agents (Russek & Zohman, 1971)	X		
	Anticoagulants (Ruusek & Zohman, 1971)	X		
	Psychopharmacologic agents (Russek & Zohman, 1971)	X		
	Nitroglycerin (Russek & Zohman, 1971)	X		
	Exercise			
	Montefiore - YMCA exercise program for the postcoronary patient (Russek & Zohman, 1971) (See Mobility Health Life Function)		X	
	Environmental Change			
	Heart kitchen			X
	Monitoring			
	Coronary care unit (Yu & Kramer, 1966)	X		
	Dietary Factors			
	Planning fat control meals (Walkertin, 1966)	X	X	
Mobility	Physical Therapy			
	Reconditioning programs (Naughton, 1973)		X	
	Montefiore - YMCA exercise program for the postcoronary patient (Russek & Zohman, 1971)		X	
Communication	None - See Note 1			

TABLE 4-8
LIST OF TECHNOLOGIES APPLIED TO CORONARY HEART DISEASE (CONTINUED)

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
Social/ Attitudinal	Psychological Counseling			
	Crisis intervention family counseling (Overs & Healy, 1971)		X	
-	Vocational Counseling			
	Prevocational evaluation and job training (Naughton, 1973)		X	
Cognitive Intellectual	None -- See Note 1			

TECHNOLOGIES APPLIED TO EMPHYSEMA

Among persons disabled by emphysema, life-function needs are heavily concentrated in the area of health, as are techniques which deal with this disability. The major problem for persons with this disability is taking enough oxygen into the system to maintain life. Once this major problem is controlled, the other life functions are relatively unaffected. Technologies for meeting the health needs of persons with emphysema are respiratory aids and oxygen supplementation devices.

The social-attitudinal life function contains the second highest number of needs for emphysema patients. These needs involve primarily loss of self-esteem, depression, and despair. Techniques for meeting social-attitudinal needs of persons with emphysema involve educating patients about and teaching them how to cope with the disease.

Although few needs relating to mobility are expressed among persons with emphysema, 25 percent of the techniques for dealing with this disability are concentrated in this life-function. However, these techniques are also included in the health area. The duplication occurs because training and use of devices to provide more oxygen to meet health needs also increase the mobility of persons disabled by emphysema.

No techniques for meeting communication and cognitive-intellectual needs are described in research sources.

The list of technologies applied to emphysema is given in table 4-9.

TABLE 4-9
LIST OF TECHNOLOGIES APPLIED TO EMPHYSEMA

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
Health	Exercise Therapy			
	Postural drainage exercises (Belinkiff, 1971)		X	
	Breathing exercises (Belinkiff, 1971; Westreich, 1970)		X	
	Oxygen Supplementation			
	Oxygen cane (Barach, 1970) (See Mobility Life Function)	X		
	Portable oxygen cylinders (Barach, 1970)	X		
	Oxy-hale or oxy-master (Barach, 1970)	X		
	Respiratory Aids			
	Maxi-myst (Petty, 1970) (See Mobility Life Function)	X		
	Hand-E-Vent (Petty, 1970) (See Mobility Life Function)	X		
	Barach-Gordon emphysema belt (Barach, 1970)	X		
	Elastic gridle (Barach, 1970)	X		
	Velcro belt (Barach, 1970)	X		
	Expectorants and bronchial detergents (Haas, 1967)	X		
	Chest physiotherapy (Belinkiff, 1971)	X		
	Bronchodilators (Haas, 1967)	X		
	IPPB (Intermittent positive pressure breathing machine) (Belinkoff, 1971)	X	X	

TABLE 4-9
LIST OF TECHNOLOGIES APPLIED TO EMPHYSEMA (CONTINUED)

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
	Comprehensive Multidisciplinary Treatment Programs			
	Team approach treatment (Haas, 1967) (See Social/Attitudinal Life Function)	X	X	
	Comprehensive care program (Fishman & Petty, 1971) (See Social/Attitudinal & Mobility Life Function)	X	X	
	Multidisciplinary rehabilitation program (Kaplan, 1970) (See Mobility Life Function)	X	X	
	Patient Education Programs			
	Patient education (Petty, 1970)		X	
	Occupational therapy programs (Berzins, 1970)		X	
	Lung Transplant			
	Single lung transplant (Allograft)	X		
Mobility	Oxygen Supplementation			
	Oxygen cane (Barach, 1970) (See Health Life Function)	X		
	Portable oxygen cylinders (Barach, 1970) (See Health Life Function)	X		
	Comprehensive Multidisciplinary Treatment Programs			
	Comprehensive care program (Fishman & Petty, 1971) (See Health Life Function & Social/Attitudinal Life Function)	X	X	

TABLE 4-9
LIST OF TECHNOLOGIES APPLIED TO EMPHYSEMA (CONTINUED)

Life Function	Technology Technique	Technology Category PI	TC	EC
	Multidisciplinary rehabilitation program (Kaplan, 1970) (See Health Life Function)	X	X	
	Respiratory Aids			
	Maxi-myst (Petty, 1970) (See Health Life Function)	X		
	Hand-E-Vent (Petty, 1970) (See Health Life Function)	X		
	Occupational Therapy Programs (Berzins, 1970) (See Health Life Function)		X	X
Communication	None - See Note 1			
Social/ Attitudinal	Self Care Treatment Devices (See Health and Mobility Life Functions)	X	X	
	Comprehensive Multidisciplinary Treatment Programs			
	Team approach treatment (Haas, 1967) (See Mobility Life Function & Health Life Function)	X	X	
	Group psychotherapy (Dudley, 1969)		X	
	Comprehensive care program (Fishman & Petty, 1971)		X	
Cognitive/ Intellectual	None - See Note 1			

TECHNOLOGIES APPLIED TO COLON/RECTUM CANCER

Among persons disabled by colon/rectum cancer, the life-function area in which by far the greatest number of needs (70 percent) occurs is the health area. Predictably, specific needs primarily involve dealing with intestinal disorders. The life-function area containing the second highest number of specific needs is the social-attitudinal area, with 18 percent of the total. Specific social-attitudinal needs are fairly widespread, including social isolation and withdrawal, disturbances of body image, anxiety, and negative feelings toward treatment.

Few or no needs are reported for the life-functions of mobility, communication, and cognitive-intellectual functioning.

The distribution of technologies for dealing with life-function needs associated with colon/rectum cancer correlates closely with the distribution of needs, with 60 percent relating to health and 40 percent relating to social-attitudinal functioning. However, the small overall number of technologies within both life-function areas probably represents a current inability to deal adequately with the disabling effects of colon/rectum cancer. Within the health life-function, specific technologies include surgical procedures, radiation therapy, and chemotherapy. Within the social-attitudinal life-function, specific technologies include psychotherapy and supportive services from societies or from other individuals disabled by colon/rectum cancer.

The list of technologies applied to colon/rectum cancer is given in table 4-10.

TABLE 4-10
LIST OF TECHNOLOGIES APPLIED TO COLON/RECTUM CANCER

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
Health	Surgical Procedures			
	Total colectomy (Burdette, 1970)	X		
	Fulguration (Destruction of carcinoma by electric current) (Clark & Cumley, 1975)	X		
	Rectal resection (Clark & Cumley, 1975)	X		
	Colonic resection (Clark & Cumley, 1975)	X		
	Radio Therapy			
	X-Rays (Shimkin, 1969)	X		
	Radium (Shimkin, 1969)	X		
	Chemotherapy			
	5 - Fluoracil (Burdette, 1970)	X		
Mobility	None - See Note 1			
Communication	None - See Note 1			
Social/ Attitudinal	Psychotherapy			
	Adjustment counseling (Cobb, 1973)		X	
	Counseling for death (Cobb, 1973)		X	
	Supportive Services			
	"Reach to Recover," " Lost Chord Club, "Ostomy Association," American Cancer Society (Rosenbaum, 1975)		X	

TABLE 4-10
LIST OF TECHNOLOGIES APPLIED TO COLON/RECTUM CANCER (CONTINUED)

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
	"Ostomy Clubs" (Dietz, 1973)		X	
	Counseling from other colostomy patients (Dietz, 1973)		X	
Cognitive/ Intellectual	None - See Note 1			

TECHNOLOGIES APPLIED TO KIDNEY DISEASE

Among persons disabled by kidney disease, nearly 60 percent of the life-function needs are in the area of health. Health needs of this group are extremely diverse, including, most prominently, skin disorders and urinary-tract disorders, followed by threats to normal system functioning, generalized tissue disorders, disorders of the arteries and veins, digestive disorders, intestinal disorders, and malfunctions of reproductive organs. Despite this diversity of needs, technologies for meeting them fall into only two main categories: prosthetic devices and surgical procedures designed to deal with the primary life-threatening effects of renal dysfunction itself, rather than with complications and side-effects of the disease. Nonetheless, these technologies make up by far the largest percentage of the total technologies for meeting the needs of persons disabled by kidney disease.

Most of the other needs of persons afflicted by kidney disease are in the social-attitudinal life function. These needs are associated with psychological reaction to treatment, and involve fear, anxiety, neurosis, depression, isolation, and anger. Technologies for meeting these needs comprise most of the remainder of the total technologies applied to kidney disease. All of the technologies applied to social-attitudinal needs fall in the category of psychotherapy. The disproportionately small number of social-attitudinal technologies compared to health technologies for persons disabled by kidney disease reflects the relatively unspecialized nature of psychotherapeutic technologies compared to the highly specialized development of renal dysfunction prosthetic devices.

Persons disabled by kidney disease have very few needs in the areas of mobility, communication, and cognitive-intellectual functioning, and correspondingly few technologies have developed in these life-function categories.

A list of technologies applied to kidney disease is given in table 4-11.

TABLE 4-11
LIST OF TECHNOLOGIES APPLIED TO KIDNEY DISEASE

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
Health	Prosthetic Devices (Artificial Organs)			
	Limited care dialysis unit (Hull, 1975)	X		
	Self care dialysis (Hull, 1975)	X		
	Wearable portably artificial kidney (Bailey, 1972)	X		
	ACAC microcapsule artificial kidney (Whelpton, 1974)	X		
	Mobile dialysis unit (Whelpton, 1974)	X		
	Klung artificial kidney	X		
	R. P. kidney (Bailey, 1972)	X		
	A. B. Gambro hemodialyzer (Bailey, 1972)	X		
	Twin coil dialyzer (Bailey, 1972)	X		
	The wind-it-yourself coil kidney (Bailey, 1972)	X		
	Kiil kidney (Bailey, 1972)	X		
	Dialung artificial kidney (Bailey, 1972)	X		
	Sorption based hemodialysis (Whelpton, 1974)	X		
	Pediatric hemodialysis unit (Levy, 1974)	X		

TABLE 4-11
LIST OF TECHNOLOGIES APPLIED TO KIDNEY DISEASE (CONTINUED)

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
	Surgical Procedures (Organ Transplantation)			
	Kidney transplantation technique (Merril, 1974)	X		
	Surgical Procedures (Tissue Transplantation)			
	Renal Unit Program	X		
	Surgical Procedures (Reconstructive-Cardiovascular)			
	In-hospital acute dialysis (Hull, 1975)	X		
	Internal arteriovenous shunt (Bailey, 1972)	X		
	Sapheneous vein graft (Bailey, 1972)	X		
	Educational Counseling			
	Home training units (Hull, 1975)		X	
	Diet Therapy			
	Dietary management (Cost, 1975)		X	X
	Drug Therapy			
	Diuretic therapy (Lant & Wilson, 1973)	X		
Mobility	Wearable Portable Artificial Kidney (Bailey, 1972)	X		X
Communication	None - See Note 1			

TABLE 4-11
LIST OF TECHNOLOGIES APPLIED TO KIDNEY DISEASE (CONTINUED)

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
Social/ Attitudinal	Psychotherapy and Counseling			
	Individual psychotherapy (Cramond, et al., 1968)		X	
	Group psychotherapy (Cramond, et al., 1968)		X	
	Family Therapy		X	
Cognitive Intellectual	None - See Note 1			

TECHNOLOGIES APPLIED TO DIABETES MELLITUS

Among persons disabled by diabetes mellitus, over half the life-function needs are in the area of health. Specific health needs are very diverse, but prominent among them are problems with other metabolic dysfunctions, direct system dysfunction, and urinary tract and kidney disorders. Technologies for dealing with health needs account for nearly all of the total technologies for dealing with diabetes mellitus. Specific technologies primarily involve drug (insulin) therapy and dietary management, but also include surgical procedures, artificial organs, education, and technologies associated with renal dysfunction and coronary disease.

The social-attitudinal life-function accounts for the second highest percentage (25 percent) of needs among persons disabled by diabetes mellitus. Specific needs involve anxiety, isolation, self-destructiveness, and depression. Only one technology, a comprehensive, multi-disciplinary treatment program, is available for meeting these needs. However, this type of technology or even one less broad which provides psychotherapy or counseling is probably best suited for meeting these needs.

Communication needs of persons disabled by diabetes mellitus primarily involve blindness and other ocular problems which are dealt with by the technology of surgical procedures such as photocoagulation, vitrectomy, and retinal indentation.

The mobility and cognitive-intellectual life functions account for relatively few needs of persons disabled by diabetes mellitus. However, within the cognitive-intellectual area, deficits in the level of thinking and abstract reasoning constitute an area of significant need. Needs of this type arise as side effects of the primary disability of diabetes mellitus and are most often dealt with through drug therapy and dietary management technologies.

A list of technologies applied to diabetes mellitus is given in table 4-12.

TABLE 4-12
LIST OF TECHNOLOGIES APPLIED TO DIABETES MELLITUS

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
Health	Surgical Procedures (See Communication Life Function)			
	Pituitary Ablation (Keen & Jarrett, 1975)	X		
	Photocoagulation (Xenon & Laser) (Keen & Jarrett, 1975)	Z		
	Vitrectomy (Keen & Jarrett, 1975)	X		
	Retinal indentation (Keen & Jarrett, 1975)	X		
	Drug Therapy			
	Atromid (Keen & Jarrett, 1975)	X		
	Insulin Administration (Oakley, Pyke & Taylor, 1975)	X		
	Prosthetic Devices (Artificial Organs)			
	Artificial endocrine pancreas (Albisser, 1974)	X		
	Education (See Social-Attitudinal Life Function)			
	Diabetes center: A five-day education course (Prater, 1974)		X	
	Teaching machine (MacDonald and Kaufman, 1963)		X	
	Diabetes detection and education (Etzqiler, 1968)	X	X	X
	Dietary Management (See Cognitive-Intellectual Life Function)			
	Sugar control diets (Oakley, et al., 1975)	X		

TABLE 4-12
LIST OF TECHNOLOGIES APPLIED TO DIABETES MELLITUS (CONTINUED)

Life Function	Technology Technique	Technology Category PI	TC	EC
	Technologies associated with renal dysfunction secondary to diabetes mellitus - (See Kidney Disease - Health.)			
	Technologies associated with coronary disease secondary to diabetes mellitus - (See Coronary Heart Disease - Health.)			
Mobility	None - See Note 1			
Communication	Surgical Procedures			
	Photocoagulation (Xenon & Laser) (Keen & Jarrett, 1975)	X		
	Vitrectomy (Keen & Jarrett, 1975)	X		
	Retinal indentation (Keen & Jarrett, 1975)	X		
Social/ Attitudinal	Comprehensive Multidisciplinary Treatment Programs			
	Diabetic Youth and Family Program (Smith, 1974)	X	X	X
	Diabetes center: A five-day education course (Prater, 1974)		X	
	Teaching machine (MacDonald and Kaufman, 1963)		X	
	Diabetes detection and education (Etzwiler, 1968)	X	X	X
Cognitive/ Intellectual	Drug Therapy			
	Insulin administration (Oakley, *et al.*, 1975)	X		
	Dietary Management			
	Sugar control diets (Oakley *et al.*, 1975)	X		

TECHNOLOGIES APPLIED TO VISUAL IMPAIRMENT

Among persons disabled by visual impairment, the greatest number of needs, as expected, is in the communication life-function. Of 48 specific needs relating to visual impairment, 40 percent are in the communication life-function. Most of the communication needs relate to reading difficulties. This finding is predictable within a society in which the ability to read is so important for normal functioning. The ability to read is, for example, the cornerstone of most educational methods within contemporary society. The second highest number of specific needs (21 percent) is in the mobility life-function.

Most of the techniques for dealing with visual impairment are found within the areas of greatest need--communication and mobility. Fifty-one percent of the techniques for dealing with visual impairment facilitate communication, and 27 percent facilitate mobility. Most of these techniques involve various sensory aids.

Approximately 19 percent of the needs associated with visual impairment are in the social-attitudinal life-function. These needs result primarily from social isolation in a world which is visually oriented. The techniques for dealing with social-attitudinal problems of the visually impaired primarily include vocational training programs, because employment seems to be particularly beneficial in reducing feelings of social isolation and dependency.

The list of technologies applied to visual impairment is given in table 4-13.

TABLE 4-13
LIST OF TECHNOLOGIES APPLIED TO VISUAL IMPAIRMENT

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
Health	None - See Note 1			
Mobility -	Sensory Aids (Tactile)			
	The path-sounder (Proscia, 1970)	X		
	Electronic cane (Frank, 1963)	X		
	Folding cane (Proscia, 1970)	X		
	Raised line drawings (Levi, 1967)	X		
	Mobility & thermatic maps (Wiedel, 1967)	X		
	Mobility Training			
	Training tape recording (Schillina, 1962)		X	
	Mobility training program (McCoig, 1967)		X	
	Independent travel training for blind children (Quinn, 1968)		X	
	Optical aid clinic (Tann, 1969)		X	
	Low vision clinic (Cross, 1963)		X	
	Prosthetic Devices			
	Optical prosthesis (Martinne)	X		
Communication	Sensory Aids (Tactile)			
	Metal alphabet plate (Keane, 1969)	X		
	Telatouch machine (Keane, 1969)	X		

TABLE 4-13
LIST OF TECHNOLOGIES APPLIED TO VISUAL IMPAIRMENT (CONTINUED)

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
	Argone braille machine (Grunna, 1975)	X		
	Translation of ink print copy to grade two braille (Puckett, 1971)	X		
	Personal print reading machine (Moore, 1968)	X		
	The international standard manual (Keane, 1969)	X		
	The American one hand manual alphabet (Keane, 1969)	X		
	MIT braille boss (Proscia, 1970)	X		
	Tactile communication with air jets (Mann, Baumann & Sheridon, 1962)	X		
	Sensory Aids (Auditory)			
	Pocket Communicator (Proscia, 1970)	X		
	RFB (Recording for the Blind) portable disc player (Levi, 1968)	X		
	Sensory Aids (Visual)			
	X-Y Platform for RAND designed television system (Clewett, 1971) (See Cognitive-Intellectual Life Function)	X		
	Mobile opthalmological unit (Rambi, 1969)	X		
	Speech Therapy			
	Current American tape program (talking book) (Marcfarland, 1968)		X	
	Education			
	Program Instruction in Braille (Heber, 1967)		X	

TABLE 4-13
LIST OF TECHNOLOGIES APPLIED TO VISUAL IMPAIRMENT (CONTINUED)

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
	A library service for the blind (Bray, 1964)		X	
	Recorded journal (Riley, 1964)		X	
	Art gallery for the blind	X	X	X
	Raven progressive matrices (Anderson, 1964)		X	
	Vocational Training			
	Intensive language program for the blind student (Dostert, 1965)		[illegible]	
	Tape duplication training program (Seward, 1968)		X	
Social/ Attitudinal	Vocational Training			
	Instructor's guide (for teaching woodworking to visually handicapped) (Trinkham, 1963)		X	
	Industrial homework program (Hainor, 1970)		X	
	Agricultural & rural training center for the blind (Moos, 1969)		X	
	Education			
	Physical education for blind children (Buell, 1964)		X	
Cognitive/ Intellectual	Sensory Aids (Tactile)			
	Compact tactile stimulator (Bliss, 1969)	X		
	Tactile television system (Batch-Y-Rits, 1969)	X		

TABLE 4-13
LIST OF TECHNOLOGIES APPLIED TO VISUAL IMPAIRMENT (CONTINUED)

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
	Sensory Aids (Visual)			
	X-Y platform for RAND sight instrument (Clement, 1971)	X		
	Education			
	Pre-college summer orientation program (Jiuoff, 1967)		X	
	Vocational Training			
	Taxpayer Service Representatives (Knoch, 1971)		X	

TECHNOLOGIES APPLIED TO HEARING IMPAIRMENT

Among persons disabled by hearing impairment, the life-function in which the greatest number of needs occurs is communication. Most of the communication needs involve difficulties in reading and writing, language skills, and articulation and other speech problems. Predictably, the communication life-function also contains by far the greatest number of technologies for dealing with hearing impairment. Most prominent among these technologies are auditory devices, such as hearing aids, and educational programs.

The life-function containing the second highest percentage of needs statements is the social-attitudinal area. The most prominent needs within this area involve social isolation and withdrawal and immaturity in social relationships. Technologies for meeting these needs include primarily vocational education and psychological intervention through clubs for persons with hearing impairments. Although none of the research sources on hearing impairment specifically mention psychotherapy for this group, such procedures presumably are appropriate for persons in this group if communication difficulties can be overcome.

Cognitive-intellectual needs of persons with hearing impairments are related primarily to learning and performance difficulties associated with the loss of one of the most important sense modalities. Special education and vocational training for the hearing impaired are the obvious and primary technologies currently being used to overcome these difficulties.

Persons with hearing impairments sometimes have needs in the mobility life-function area. These needs usually involve problems with kinesthetic motor reactions and balance. However, no technologies for dealing with these problems are described in research sources.

The life-function area in which persons with hearing impairments have fewest needs is health. Presumably because the health needs of persons in this group are not substantially different from those of persons in the general population, no specific technologies for dealing with health problems of persons with hearing impairments are described in research sources.

The list of technologies applied to hearing impairment is given in table 4-14.

TABLE 4-14
LIST OF TECHNOLOGIES APPLIED TO HEARING IMPAIRMENT

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
Health	None - See Note 1			
Mobility	None - See Note 1			
Communication	Sensory Aids (Auditory)			
	The body hearing aid (Sanders, 1971)	X		
	Behind the ear aid (Sanders, 1971)	X		
	Auditory training unit (Sanders, 1971)	X		
	Group auditory trainer (Sanders, 1971)	X		
	Electrowriter (RD-1526, 1965)	X		
	In the ear aid (Sanders, 1971)	X		
	Instantaneous pitch period indicator (Delasky, 1969)	X		
	MEDESCO OL.63 hearing aid	X		
	Sensory Aids (Tactile)			
	Tactual speech aids (Picket, 1969)	X		
	Psychological Intervention			
	Mother's group aid therapy (Musiler, 1968)		X	
	Auditory training games (Prescott, 1971)		X	
	Education Programs			
	Sign language (Jones, 1965)		X	

TABLE 4-14
LIST OF TECHNOLOGIES APPLIED TO HEARING IMPAIRMENT (CONTINUED)

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
	A program for teaching language to young children with central auditory disorders (Blender, 1968)		X	
	Acoupedic approach (Musiler, 1968)		X	
	Polaroid camera used in teaching language (Wallace, 1971)		X	
	Visual language (Bell, 1971)		X	
	The system sign language (Paget, 1969)		X	
	Mechanical Aids			
	Teletypewriters for the deaf (Jones, 1965)			X
	Bioelectric Techniques			
	Electrical stimulation in eighth nerve deafness (Doyle, 1965)	X		
Social/Attitudinal	Vocational Education			
	National theatre of the deaf of America (Kensall, 1969)		X	
	Psychological Interventions			
	Hard of hearing club (Thoms, 1969)		X	
Cognitive/Intellectual	Vocational Training			
	Vocational training for multiply handicapped deaf (Hurwitz, 1971)		X	
	Education			
	Special education for the deaf (Katz et al., 1974)		X	

TABLE 4-14
LIST OF TECHNOLOGIES APPLIED TO HEARING IMPAIRMENT (CONTINUED)

Life Function	Technology Technique	Technology Category		
		PI	TC	EC
Health	None - See Note 1			
Mobility	None - See Note 1			
Communication	Sensory Aids (Auditory)	X		
	The body hearing aid (Sanders, 1971)	X		
	Behind the ear aid (Sanders, 1971)	X		
	Auditory training unit (Sanders, 1971)	X		
	Group audtiory trainer (Sanders, 1971)	X		
	Electrowriter (RD-1526, 1965)	X		
	In the ear aid (Sanders, 1971)	X		
	Instantaneous pitch period indicator (Delasky, 1969)	X		
	MEDESCO OL.63 Hearing Aid	X		
	Sensory Aids (Tactile)			
	Tactual speech aids (Picket, 1969)	X		
	Psychological Intervention			
	Mother's group aid therapy (Musiler, 1968)		X	
	Audotory training grames (Prescott, 1971)		X	
	Education Programs			
	Sign language (Jones, 1965)		X	

TABLE 4-14
LIST OF TECHNOLOGIES APPLIED TO HEARING IMPAIRMENT (CONTINUED)

Life Function	*Technology* Technique	Technology Category		
		PI	TC	EC
	A program for teaching language to young children with central auditory disorders (Blender, 1968)		X	
	Acoupedic approach (Musiler, 1968)		X	
	Polaroid camera used in teaching language (Wallace, 1971)			
	Visual language (Bell, 1971)		X	
	The system sign language (Paget, 1969)		X	
	Mechanical Aids			
	Teletypewriters for the deaf (Jones, 1965)			X
	Bioelectric Techniques			
	Electrical stimulation in eighth nerve deafness (Doyle, 1965)	X		
Social/ Attitudinal	Vocational Education			
	National theatre of the deaf of America (Kensall, 1969)		X	
	Psychological Interventions			
	Hard of hearing club (Thoms, 1969)			
Cognitive/ Intellectual	Vocational Training			
	Vocational training for multiply handicapped deaf (Hurwitz, 1971)		X	
	Education			
	Special education for the deaf (Katz et al., 1974)		X	

STATISTICAL SUMMARY OF TECHNOLOGIES DATA

Several important generalizations concerning the way technologies are applied to the problems of disability may be drawn from the data in the technologies tables. These generalizations concern (1) the distribution, according to life-function, of types of technologies--physical intervention, training and counseling, and environmental change--available for meeting life-function needs, (2) the distribution, within each of the 14 specific disability groups, of types of technologies availabel for meeting the life-function needs of each group, (3) the total number of specific technologies available for meeting needs within each of the five life-function areas, and (4) the total number of specific technologies available for meeting life-function needs associated with each of the 14 representative disabilities.

Distribution among the three categories of technologies varied according to life-function need served. Figure 4-1 shows that in the areas of health, motility, and communication, physical-intervention technologies predominate, followed by training and counseling. However, very few environmental change technologies are reported for meeting life-function needs in these areas. In the cognitive-intellectual and social-attitudinal areas, training and counseling technologies predominate, followed by physical intervention, with few environmental-change technologies reported.

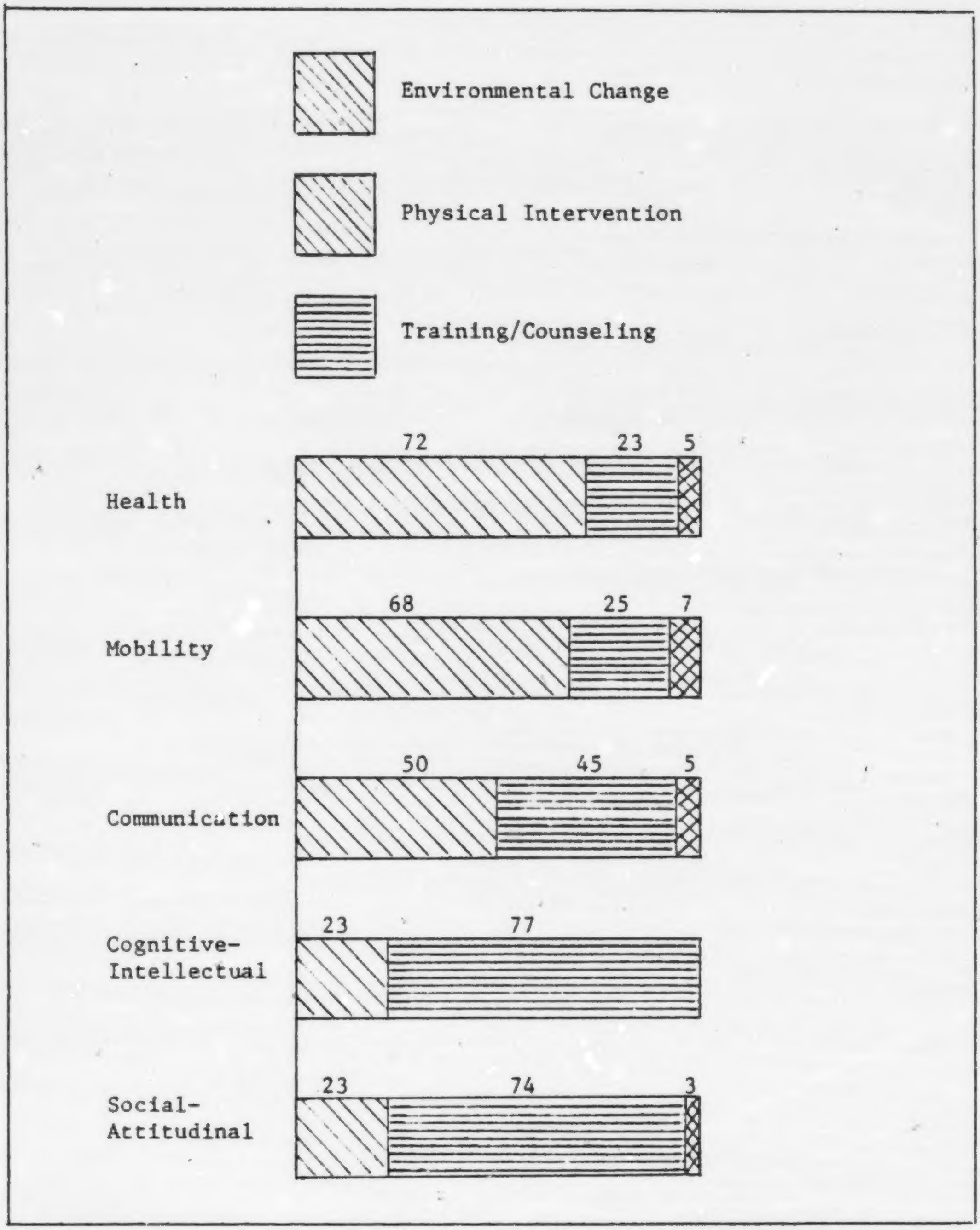


Figure 4-1. Distribution of technologies by life-function needs

Distribution among the three categories of technologies also varies among the 14 representative disability groups. As shown in figure 4-2 technologies applied to visual impairment, cerebral palsy, emphysema, and coronary heart disease are about equally divided between physical intervention and training and counseling, with very few environmental-change technologies reported for these disability groups. Technologies applied to hearing impairment, schizophrenia, and mental retardation are primarily training and counseling technologies, followed by physical intervention for hearing impairment and schizophrenia, and environmental change for mental retardation. Among the remaining disabilities--epilepsy, colon/rectum cancer, stroke, spinal cord injury, rheumatoid arthritis, diabetes mellitus, and kidney disease-- physical intervention technologies predominate. One obvious conclusion to be drawn from these figures is that environmental change technologies may be underdeveloped and under used.

Numbers of specific technologies available for meeting the various types of life-function needs also vary considerably. As shown in figure 4-3, technologies applied to health needs far outnumber other types of technologies, followed by technologies applied to mobility and social-attitudinal needs. Technologies applied to communication needs rank fourth, and technologies applied to cognitive-intellectual needs rank fifth. Reasons for these differences are not yet apparent.

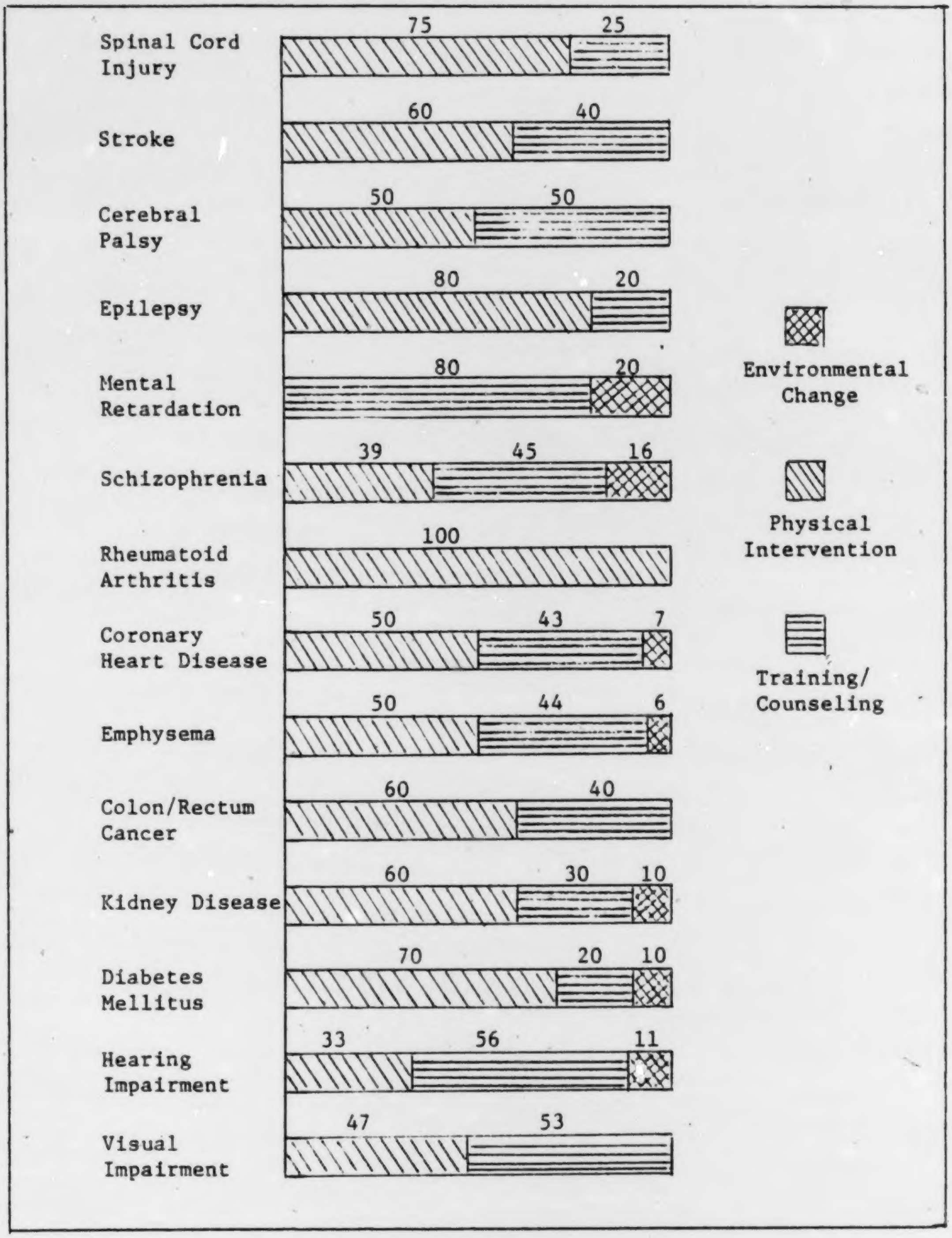


Figure 4-2. Distribution of technologies meeting life-function needs within specific disabilities

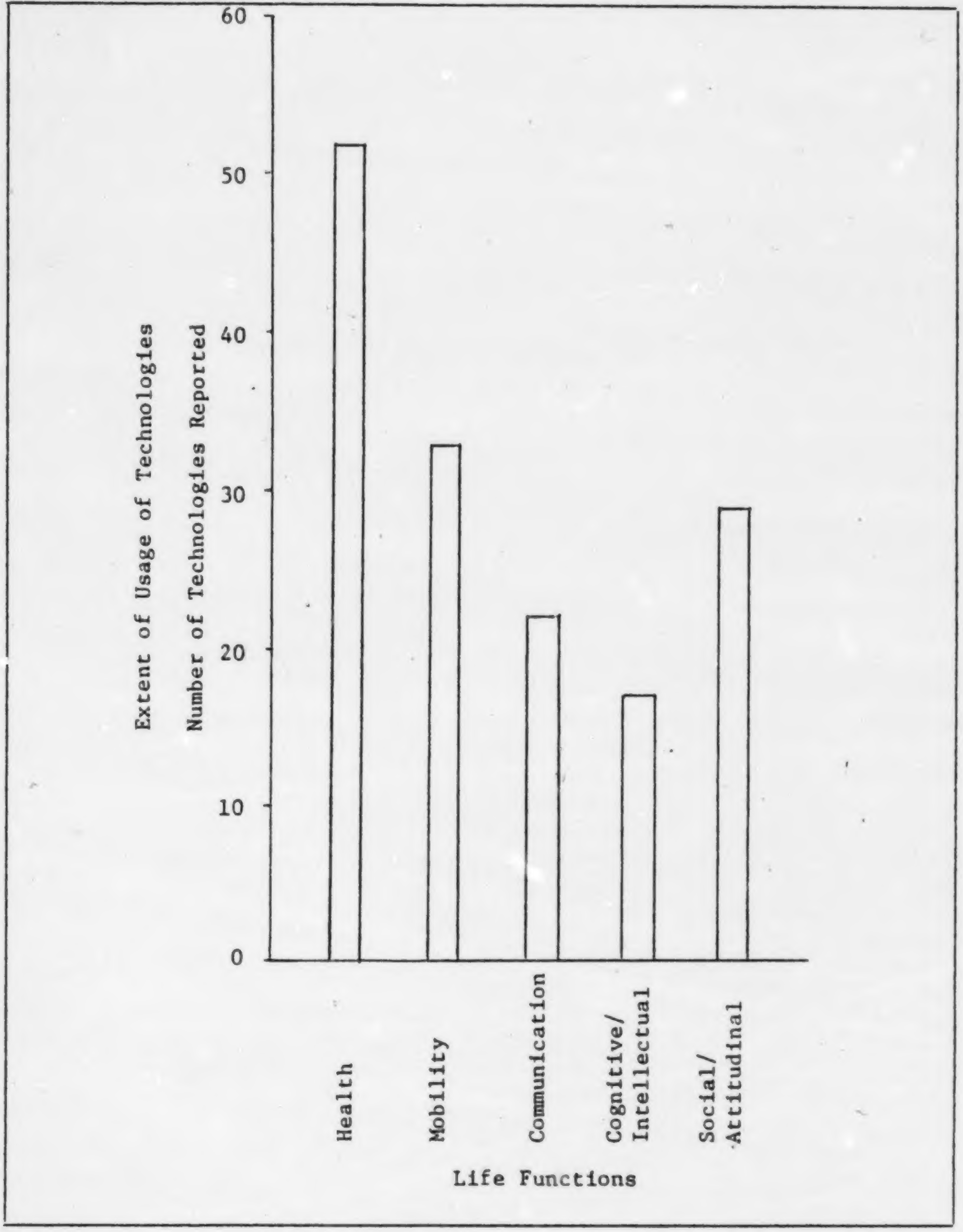


Figure 4-3. Total numbers of technologies within each life function

Numbers of technologies available for meeting the needs for various disability groups also vary. Figure 4-4 shows that the disability groups for which the greatest number of technologies are available are visual impairment, coronary heart disease, emphysema, stroke, spinal cord injury, and mental retardation. In the middle range with regard to number of technologies available are schizophrenia, cerebral palsy, hearing impairment, and disabilities in the chronic disease group--rheumatoid arthritis, diabetes mellitus, and kidney disease. The disability groups for which the fewest technologies are available are colon/rectum cancer and epilepsy.

Since technologies can be further divided into the different techniques used in the environmental change, physical intervention, and training and counseling classes, a figure showing how the different techniques are distributed under each of the life function by classes of technologies can be useful in making some inferences. Figures 4-5, 4-6, and 4-7 show this breakdown of techniques for the five life functions for each of the environmental change, physical intervention, and training and counseling areas. From these figures the following inferences can be made within the constraints of the exhaustiveness of the literature search.

1. These figures clearly show that in some areas no techniques exist--an indication that relatively little work is being done in these areas. This also reflects

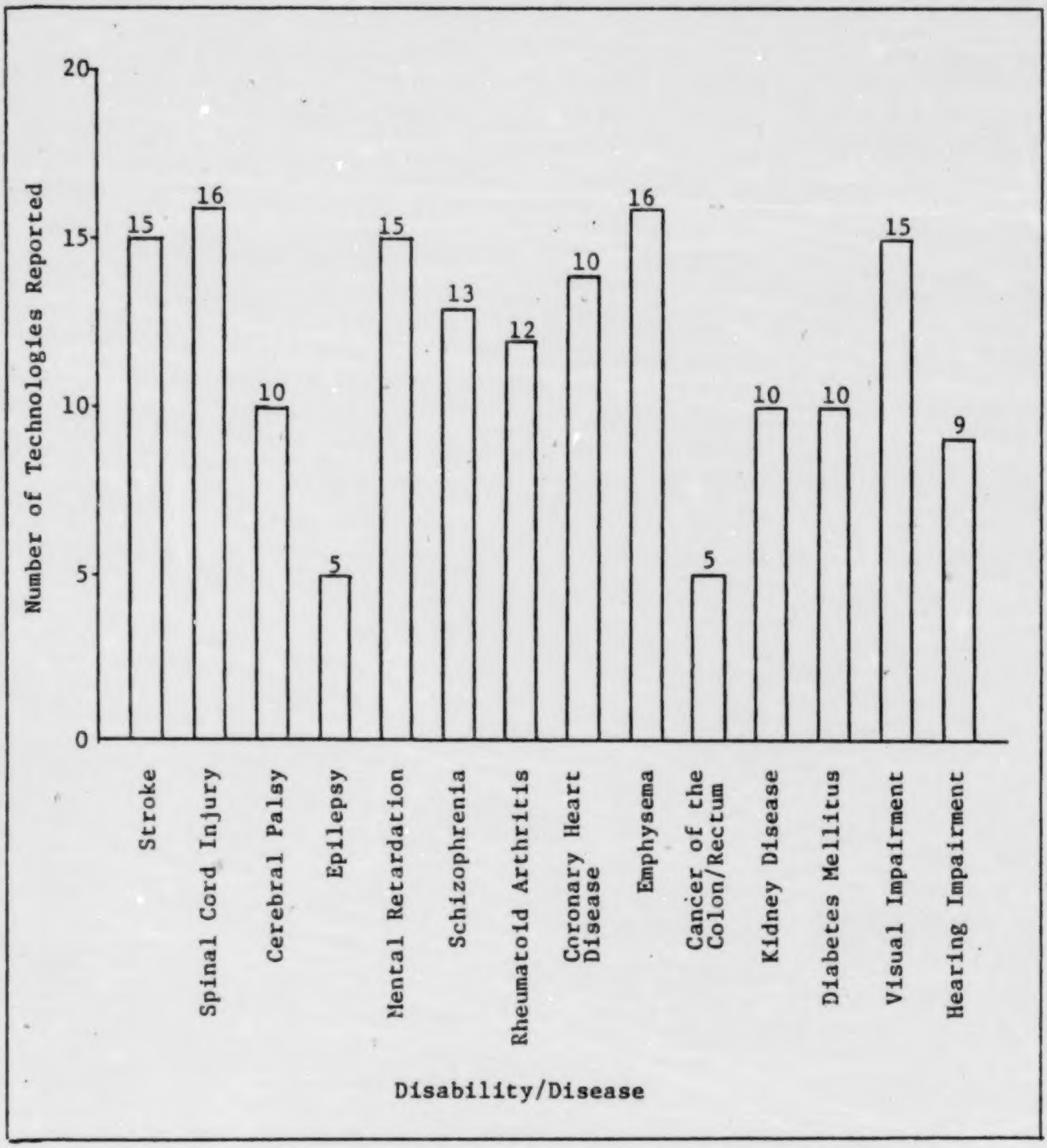
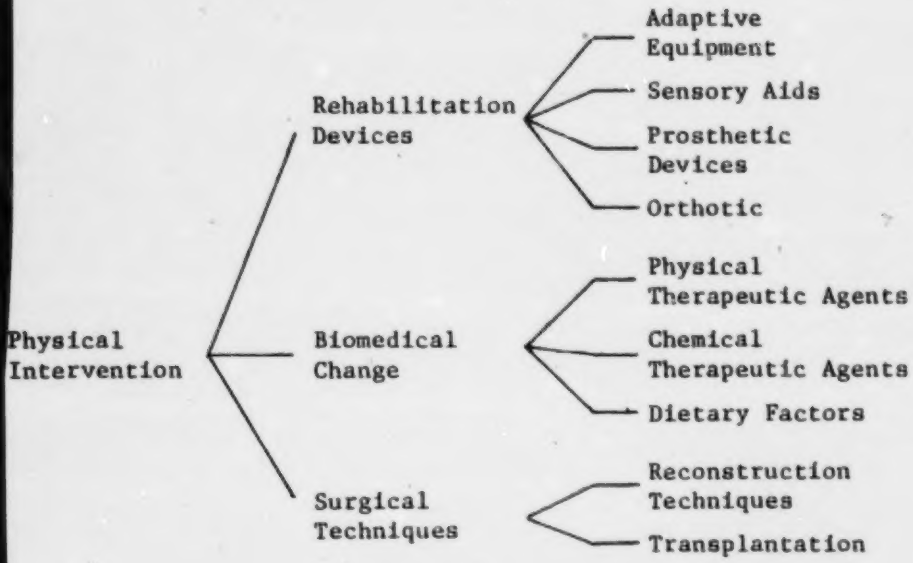


Figure 4-4. Total number of technologies used in each disability group

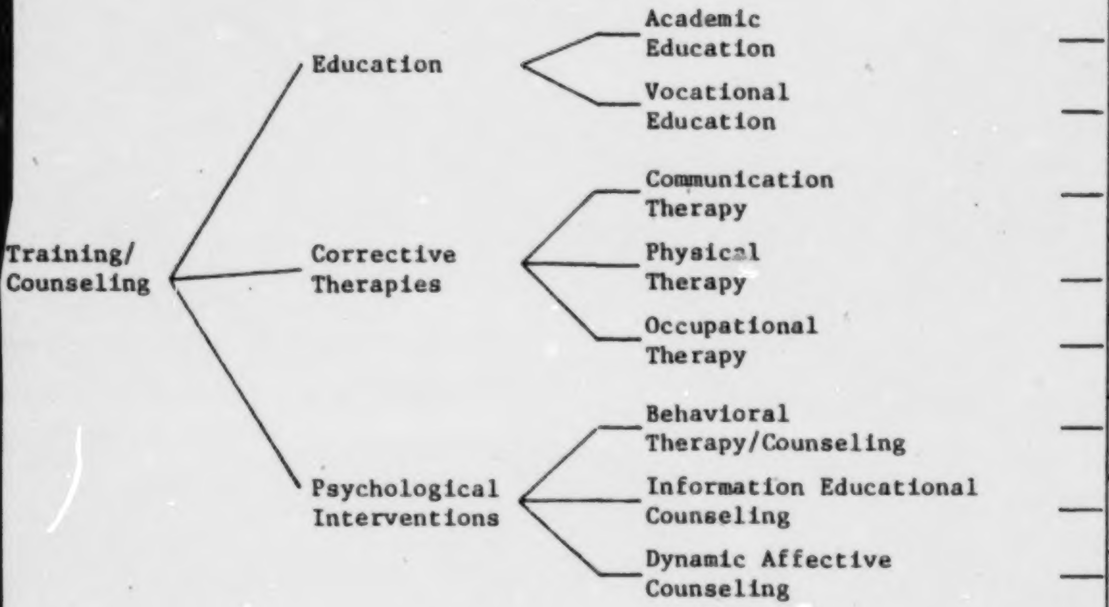
			LIFE FUNCTION					
			Health	Mobility	Communication	Social Attitudinal	Cognitive Intellectual	Total Count
Environmental Change	Community Design	Physical Environment						
		Social Environment		3	1	2		6
	Living Environment	Community Based	1					1
		Institution Based						0
	Employment Environment	Physical		1		1		2
		Programs		1	1	3		5
		Financial						0
	Transportation	Goods or Services						0
		People		6		2		8
TOTAL			1	11	2	8	0	22

Figure 4-5. Environmental change technologies


Physical Intervention
Rehabilitation Devices
Biomedical Change
Surgical Techniques
Adaptive Equipment
Sensory Aids
Prosthetic Devices
Orthotic
Physical Therapeutic Agents
Chemical Therapeutic Agents
Dietary Factors
Reconstruction Techniques
Transplantation

	LIFE FUNCTION					
	Health	Mobility	Communica-tion	Social/ Attitudinal	Cognitive Intellectual	Total Count
Adaptive Equipment	13	12	37	14		76
Sensory Aids		5	23		3	31
Prosthetic Devices	15	12	3			30
Orthotic	11	28				39
Physical Therapeutic Agents	20	7	1	2		30
Chemical Therapeutic Agents	23	5	3	3	2	36
Dietary Factors	6					6
Reconstruction Techniques	29	6	3	2		40
Transplantation	3					3
TOTAL	120	75	70	21	5	291

Figure 4-6. Physical intervention technologies


Training/ Counseling
Education
Corrective Therapies
Psychological Interventions
Academic Education
Vocational Education
Communication Therapy
Physical Therapy
Occupational Therapy
Behavioral Therapy/Counseling
Information Educational Counseling
Dynamic Affective Counseling

	LIFE FUNCTION					
	Health	Mobility	Communication	Social/ Attitudinal	Cognitive Intellectual	Total Count
Academic Education	4	2	11	6	11	34
Vocational Education			2	13	11	26
Communication Therapy		1	14		2	17
Physical Therapy	14	14	1	7		36
Occupational Therapy	1	1		11	1	14
Behavioral Therapy/Counseling	2		1	14		17
Information Educational Counseling	9			2		11
Dynamic Affective Counseling				4		4
TOTAL	30	18	29	57	25	159

Figure 4-7. Training and counseling technologies

the need to develop new techniques to fill the gaps in the current state of the art.

2. Special attention should be given to the environmental change category where very few techniques were found in the literature. This could be due to the fact that the literature search was not exhaustive, or the fact that few techniques for environmental change appear as rehabilitation technologies, but rather may appear in literature related to architecture. None-the-less, such distribution of techniques by life function and technologies give some indication of the relative number of technologies reported in the literature searched in relation to the class of technologies for the five life functions.

Relationship Between Needs and Technologies to Meet these Needs

The extent to which currently available technologies meet actual needs of disabled persons is of great significance for an assessment of rehabilitation technology. To determine the correlation between these two factors, percentages of needs and technologies were cast separately in 4 x 5 matrices (life function x disability grouping category--see Life Function report) as shown in tables 4-11 and 4-12. The percentages in table 4-12 are percentages of technologies (well-defined groupings of techniques), not percentages of individual techniques. Thus, as shown in these tables, 6 percent of the total 1222 needs statements refer to health needs of persons in the motor disability category, whereas 7 percent of the total 153 technologies apply to health needs of persons in this disability category.

The degree of association between needs and technologies determined through computation of a Pearson r which was found to be 0.88. The slope of the regression line was found to be 1.0. The correlation coefficient figure means that the availability of technologies for treating various disabilities is closely related, at least quantitatively, to the needs associated with those disabilities. The regression slope of 1.0 means, essentially, that for every percentage point increase in a particular area of life-function need for a particular disability category, there is a corresponding increase in the percentage of technologies

TABLE 4-11
SUMMARY TABLE OF NEED STATEMENTS BY LIFE FUNCTION AND DISABILITY GROUPINGS*

	Disability Groupings*			
	Motor	Behavioral	Chronic Disease	Senses
Health	78 (6%)	56 (5%)	243 (20%)	9 (1%)
Mobility	121 (10%)	34 (3%)	49 (4%)	17 (1%)
Communication	37 (3%)	50 (4%)	15 (1%)	50 (4%)
Social/ Attitudinal	83 (7%)	83 (7%)	115 (9%)	35 (3%)
Cognitive/ Intellectual	14 (1%)	105 (9%)	12 (1%)	16 (1%)

1222
(100%)

*Motor = Spinal cord injury
Stroke
Cerebral palsy

Behavioral = Mental retardation
Epilepsy
Schizophrenia

Chronic Disease = Rheumatoid arthritis
Coronary heart disease
Emphysema
Cancer colon/rectum
Kidney disease
Diabetes mellitus

Senses = Hearing impaired
Visually impaired

TABLE 4-12
SUMMARY TABLE OF TECHNOLOGIES BY LIFE FUNCTIONS AND DISABILITY GROUPINGS*

	Disability Groupings*			
	Motor	Behavioral	Chronic Disease	Senses
Health	11 (7%)	5 (3%)	36 (24%)	0 (0%)
Mobility	15 (10%)	3 (2%)	12 (8%)	3 (2%)
Communication	5 (3%)	4 (3%)	1 (1%)	12 (8%)
Social/ Attitudinal	5 (3%)	11 (7%)	9 (6%)	4 (3%)
Cognitive/ Intellectual	3 (2%)	6 (4%)	2 (1%)	6 (4%)

153
(100%)

* Motor = Spinal cord injury
Stroke
Cerebral palsy

Behavioral = Mental retardation
Epilepsy
Schizophrenic

Chronic Disease = Rheumatoid arthritis
Coronary heart disease
Emphysema
Cancer colon/rectum
Kidney disease
Diabetes mellitus

Senses = Hearing impaired
Visually impaired

available for meeting these needs. The relationship between these factors is shown in figure 4-8. Regression line A represents a situation in which the number of technologies is closely correlated with needs; however, for every 1-point increase in needs, there is only a 1/2-point increase in technologies applicable to that need. Regression line B represents a situation in which approximately two technologies are available for every one need reported.

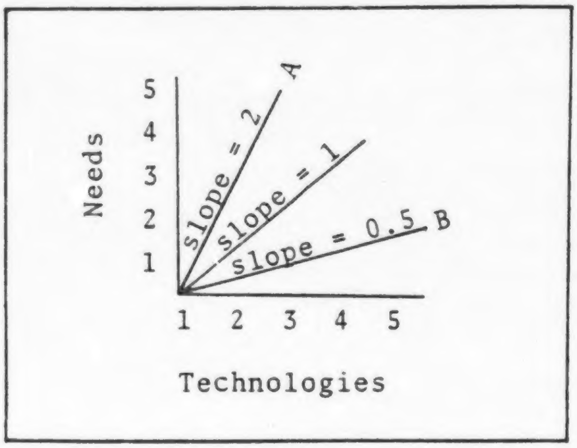


Figure 4-8. Regression slope of technologies in relation to needs.

The slope of regression of 1.0 for the technologies and need data is very good, if for every need a technology is available which satisfies it. However, this situation is not likely. More than one technology, for example, may be required to meet a need, in which case, a slope of less than 1.0 in the regression of technologies on needs would be desirable. Conversely, a slope of greater than 1.0 would be satisfactory if a single technology is applied to more than one disability as is often the case.

The apparently high degree of association between the numbers of needs and technologies may be misleading for another reason. The quality or effectiveness of the technologies in meeting the needs associated with the disabilities is not readily ascertainable. However, it seems reasonable that the number of technologies available for meeting the needs associated with a particular disability would be positively related to success or effectiveness in treatment.

Conclusions and Recommendations: A Means for Comparing Technologies

One practical application of information developed in a technology assessment is establishing guidelines, decision-making rules, and other aids for those responsible for establishing priorities for fund allocation and planning of future program. In the past, these priorities have been established through personal preferences of those in the decision-making positions (such as salience of a particular disability due to a person in the administrator's family having that disability) or through publicity due to lobby effects of a strongly organized disability advocacy group. In the development of a more rational decision-making process for the future, a concrete and more readily quantifiable means of weighing the factors involved is necessary. For example, one of the most important conclusions to be derived from the technologies data is that although technologies may be defined and made comparative on a semantic or logical level, there are such vast differences between them qualitatively, that no definitive direct comparisons can be made.

A promising approach to ascertaining the values of different technologies for comparison purposes and subsequent establishment of monetary or social priorities involves weighting the many different factors inherent in the technologies and disabilities in a formula similar to the following. Where variables = V_x and weights = W_x, a technology can be represented as a function of all the variables involved, weighted by their relative importance. Thus, a particular technology might be assigned a value as follows:

$$\text{Technology } X = f\,(W_1V_1,\ W_2V_2,\ W_3V_3,\ \text{etc.})$$

Given such a value for a technology, the relative values of different technologies can be compared as follows:

$$\text{Technology}_x = f\,(W_1V_1,\ W_2V_2,\ W_3V_3)$$

and

$$\text{Technology}_y = f\,(W_4V_4,\ W_5V_5,\ W_6V_6)$$

No attempts are made in this study to establish what the relative weights of the different variables should be. It is probably not possible to assign relative weights on the basis of scientific analysis. The final judgment of which variables are more important is probably based on philosophical or social-ethical issues. However, among the variables which should be considered are the following.

1. Number of persons affected: This variable is important in several respects. In some respects, sheer numbers reflect the widespread nature of a disability and therefore, perhaps, its relative importance. However, if a problem is extremely widespread, it may tend not to be seen as deviant at all, as is the case with minor visual disabilities such as astigmatism. The potential number of people affected is also, of course, a factor in costs as outlined below.
2. Age at which intervention can be made: The rationale for

including this variable derives from the number of years of improved life obtainable through use of alternative technologies. This factor would enter into decisions on the use of alternative technologies, such as early developmental intervention or vaccines versus treatment technologies which are restorative at a later age.

3. Extent to which the disability addressed by the technology is life threatening: This variable is very important as a multiplier used with other variables. For example, mortality rate could be multiplied by the number of people with a disability to make two disabilities equivalent or comparable, e.g., high number of people with myopia with low mortality rate versus few people with Tay-Sacks disease, a form of mental retardation which is of relatively low incidence but almost 100 percent fatal.

4. Cost per person: This measure is simply the cost for developing and implementing a technology divided by the number of potential beneficiaries. This factor, or course, is integrally related to variable number 1 (number of persons affected). Among these are the following:

    A. Research costs: Is developmental research necessary, or are all costs related to implementation of existing technologies? For example, what costs are involved in the need to develop treatments for schizophrenia versus the need to make dialysis equipment, which is extremely costly on an individual basis, available to all potential users.

B. Reusability of hardware or systems involved in the technology: The costs of special education programs, for example, include training of teachers, development of programs and special materials. However, in this case, development of these procedures and trained personnel is applicable to multiple clients both at the same time (for example, in a classroom) and over time (different years), and also the same system can be used all over the country once developed. On the other hand, a specific piece of equipment (for example, a wheelchair or other prosthetic device) with specific cost x, may only be useable by one individual over his lifetime.

C. Substitution versus addition: Costs for a new technology in which current resources are used in a different way may be lower than costs for a technology with calls for the addition of training, personnel, or equipment. Examples of these differing technologies are a different therapeutic regime to be used by psychotherapists treating schizophrenics versus the development of a new treatment facility and additional equipment to treat emphysema.

D. Extent to which future technological breakthroughs relate to costs per unit through decreases in manufacturing and distribution expenses: This factor also relates to numbers of persons affected since mass production almost always results in decreased per unit cost.

E. Availability of sufficient manpower: Will there be enough skilled personnel to implement a program? Can part or all of the technology be automated, or are any procedures developed potentially self-administered? Contrasting examples include complicated surgical techniques to restore heart function versus self-administered insulin, and automation of teaching machines for the retarded or computerized psychotherapy versus individual programs for schizophrenics.

5. Extent to which the proposed technologies create productive individuals versus mere life support: The degree of rehabilitation associated with a technology can range from maintenance of life in a vegetative state to almost complete return or achievement of a normal, productive life (see also variable 6 below, which deals with measurement of normality). Cost factors are related to the economic effects of creating self-sufficient, productive individuals. Examples of technologies in which this factor is involved are restoring lost vision when this is the only disability versus supporting life functions for a person in a comatose state.

6. Double factor of specificity--(1) specificity in the diagnosis of the degree of disability, or degree of impairment, and (2) specificity in degree of application of a given technology: These two types of specificity help to define the number of specific techniques found in a given technology, the popularity in terms of wide acceptance of a technology, and the success of a technology or the degree

to which it meets the needs of a particular disability group. Examples from three representative disability groups should help clarify these two variables: visual impairment; mental retardation; and schizophrenia.

		SPECIFICITY IN APPLICATION OF TECHNOLOGY	
		High	Low
DIAGNOSIS	High	Visual Impairment	Mental Retardation
	Low		Schizophrenia

Figure 4-9. Specificity in diagnosis of degree of disability

Figure 4-9 shows a means of displaying disabilities along the two axes of specificity: convergence of diagnosis of disability and specificity of application of technology. Visual impairment (excluding total blindness) is a disability for which very precise means of assessing the extent of disability are possible and have been developed. A patient can be very precisely measured for visual acuity (refractive errors), color discrimination, depth perception and stereopsis. This high degree of diagnostic specificity is coupled with advanced technological achievement in the field of lens grinding and optics which developed historically, independently of the diagnosis of visual acuity. The coupling of these two "specificities" results in a widely accepted, used, low- (and effective))cost, highly successful application of technology to visual impairment.

Mental retardation is a disability which falls into a high-low specificity position: high on specificity of diagnosis--low in specificity of application of rehabilitation technology. Specificity of diagnosis is available thru quantification of IQ scores and adaptive behavior scales which can yield a precise (and reliable) set of scores indicating a precise degree of retardation (if definition by IQ score is accepted). The low specificity in application of technology derives from the fact that there is no way to equate numbers of hours, days, or years in a special education program with any degree of alleviation of the disability.

Schizophrenia rates low on both specificity scales. It is often not possible to get two different clinicians to agree on the presence or absence of schizophrenia, let alone the degree of schizophrenia. There is also a low specificity in the type, amount, and effect of various treatments.

Often the two factors of diagnosis and application of technology are interrelated, but even in the case of schizophrenia, precise scales could be developed to diagnose degree and type of impairment, with no corresponding increase in application of effective technologies. It is also true that some of the most effective couplings of diagnosis and

and treatment have developed independently as with visual measurement and lens grinding technologies.

Many of these variables are interrelated and as such are difficult to categorize. In addition, this interrelation means that in any formula representing a value of a technology, some of the variables should be multiplied by others as well as by subjective weights.

Policy makers may, in addition to the base-line variables described in this chapter, select other variables to be included in a comparison of technologies. However, when variables are agreed upon, and a weighting scheme is devised, an objective comparison of technologies will be possible.

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